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Relationships Between Group Averages and Individual Observations

By Martin E. Abel and Frederick V. Waugh[1]

CORRELATION AND REGRESSION equations are often based upon group averages rather than upon individual observations. It is not always recognized that the results may be substantially different, especially the two kinds of correlation. This does not mean that one kind of correlation is always "right," nor that the other kind is "spurious" or "biased." The correlation that is appropriate in a particular case depends upon the purpose of the study.[2]

In many practical cases, the correlations based upon group averages tend to be higher than those based upon individual observations. An example of this was brought to the attention of one of the authors some years ago by the late Dr. Margaret Jarman Hagood, in connection with her work on levels of living. She computed the correlations in table 1 which show the relationships between total farm family living expenditures and several items. The first column in the table shows the correlations based upon 3,985 individual observations. We shall use the cooefficient $r_{(ind)}$ throughout this paper to indicate the correlations based upon individual observations. The second column is based upon the same data as column 1, but the data were averaged for each of 97 counties. Throughout the paper we will use the coefficient $r_{(gr)}$ to represent correlations based upon group averages.

Note that in all cases the correlations based upon group averages are higher than those based upon individual observations. The correlations in the second column are what the sociologists commonly call ecological correlations; meaning correlations based upon averages by counties, States, or other geographical areas. Ordinarily these ecological correlations and many other correlations based upon group averages tend to be substantially higher than the correlations based upon individual observations. This fact was pointed out by Robinson (7). Goodman (2, p. 611) states that "it has been shown that ecological correlations cannot be used as substitutes for individual correlations. However, ecological correlations may be of interest in themselves; the kinds of questions that can be answered by a study of ecological correlations are sometimes of direct concern to social scientists. In some problems, both ecological and individual correlations and the relations between them may be of interest. Even if the investigator is concerned only with the individual correlations, ecological data may be of service, though ecological correlations are not recommended."

Table 1.--Correlations between total farm family living expenditures and several items, 1955

Item	$r_{(ind)}$ based upon 3,985 individual observations	$r_{(gr)}$ based upon 97 averages by counties
Value of products	0.33	0.73
Education expense	.43	.50
Medical care expense	.56	.79
Recreation expense	.14	.82
Reading expense	-.11	.82

Recently Grunfeld and Griliches (6) discussed the more general problem of relationships based upon group averages. They presented

[1] The authors wish to express their appreciation to Clark Edwards, Economic Research Service, whose assistance greatly improved the presentation in this paper, particularly in the last section.

[2] A similar point about correlations between ratios is made by F. E. A. Briggs (1, p. 162). (Underscored numbers in parentheses refer to the Literature Cited, p. 115.)

two interesting, practical examples, together with a mathematical analysis which indicates that we should expect that a correlation based upon group averages would be higher than a correlation based upon the individual observations from which the group averages were derived.

We propose in this paper to analyze a fairly simple statistical problem. We have used this particular example to compute a number of regression equations and correlation coefficients. In each case we have computed two regressions and two correlations: one based upon individual observations, and another based upon group averages.[3] We shall first present the results of these computations. Then we shall give a brief theoretical analysis of the problem.[4] And finally, we shall discuss some of the implications of these findings for economic research.

The Example to be Analyzed

We have illustrated this problem by an analysis of data concerning the income and value of food consumed by 80 low-income families in a large Eastern city. These families were all receiving some kind of public assistance. Some of them were receiving cash welfare payments, some were receiving donated surplus foods, and some were receiving both forms of assistance. The data were gathered by the U.S. Department of Agriculture in the early spring of 1961 for use in connection with the development of pilot food stamp programs in eight areas of the country.

The data obtained from these 80 families included information on the value of food consumed during a one-week period, on family income (including relief payments) in the previous month, on the number of persons in the family, and on several other matters that do not concern us here.

[3] An example of this type of comparison is found in George R. Rockwell, Jr. (8).

[4] Readers are referred to the Grunfeld-Griliches article (6) for a more rigorous mathematical treatment of the problem.

RELATIONSHIPS BASED UPON INDIVIDUAL OBSERVATIONS

Figure 1 is a typical "dot chart." Each of the 80 solid dots shows the monthly income, X, and food consumption (in value terms), Y, by one of the individual families. The solid line marked (1) is the regression of food consumption upon family income; i.e., it is the line to be used in estimating the expected food consumption of an individual family associated with a given level of family income. It shows that an increase of one dollar in family income is associated with an average increase of $0.105 in value of food consumed. The dashed line marked (2) is the regression of family income upon food consumption; i.e., it is the line to be used in estimating the expected income of an individual family associated with a given level of food consumption. It shows that an increase of one dollar in food consumption is associated with an increase of $2.252 in income. Both of these regressions were computed on the basis of the 80 individual observations. The squared correlation r^2_{xy} is equal to the product of the two regression coefficients; i.e.,

$$(1) \qquad r^2_{xy} = 2.252 \times 0.105 = 0.24.$$

You could see that the correlation is small without computing the correlation coefficient. The smallness of the correlation is indicated by the wide scatter of the dots in figure 1.

RELATIONSHIPS BASED UPON AVERAGES BY INTERVALS OF INCOME

The solid dots in figure 2 are the same as those in figure 1. But in figure 2 we have classified the families into seven income groups: those getting less than $100 a month, those getting from $100 to $125, etc. The circled dots represent the average family income and average food expenditures in each income group. The two regression lines in figure 2 are both regressions of Y on X; that is, both lines are estimates of expected food consumption associated with given amounts of family income. The solid line

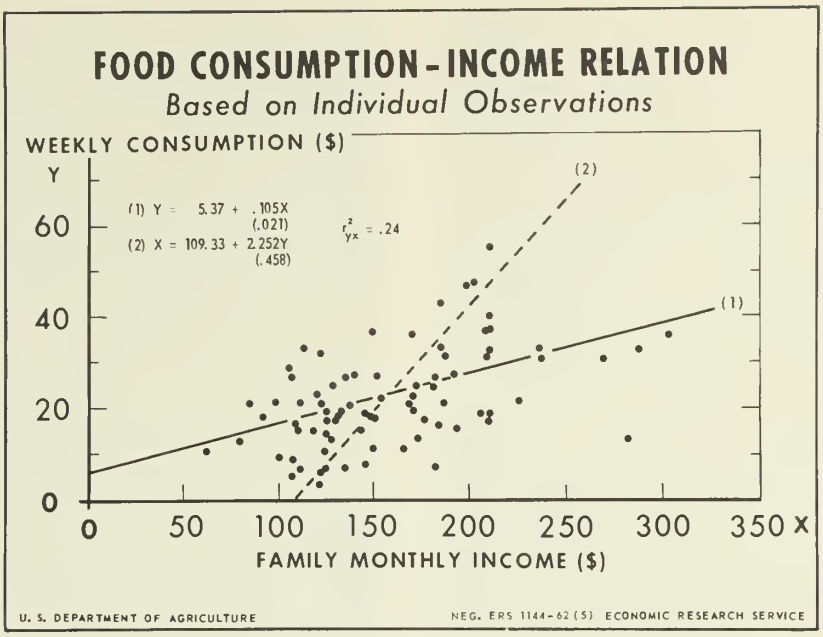

Figure 1

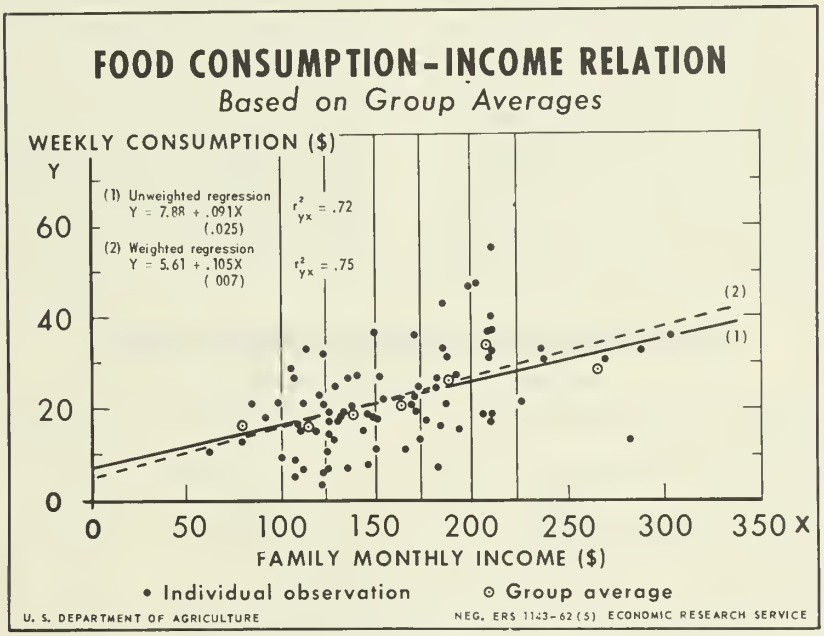

Figure 2

marked (1) is an unweighted regression; that is, it gives each group average the same weight regardless of the fact that group 1 includes only 5 families, whereas group 2 includes 21 families, for example. The dashed line marked (2) is a weighted regression; that is, it weights each group average by the number in the group.

In many cases when statisticians have used group averages as the basis for regressions and correlations, they have not bothered to weight the averages by the number of observations. This, we believe, is a reprehensible practice because it gives averages based on a few observations the same weight as averages

based on many observations, and it introduces a bias in the regression equation. If group averages are used at all, they should be weighted by the number of observations in each group. Thus, we strongly prefer the regression marked (2) rather than the one marked (1).

We note that the weighted regression in figure 2 is almost identical to that in figure 1. The correlations, however, are quite different. The squared correlation between the individual observations in figure 1 is 0.24. The squared correlation between the group averages in figure 2 is 0.75. In general, if the data are grouped by intervals of X, and if regressions and correlations are based upon the averages of X and Y in each group, the regression of Y upon X will be practically the same as the regression based upon individual observations; while the correlation based upon the group averages will usually be substantially higher than that based upon individual observations. We will discuss the reasons for this later in the paper.

RELATIONSHIPS BASED UPON AVERAGES BY INTERVALS OF FOOD EXPENDITURES

Figure 3 is similar to figure 2 except that the averages are taken by intervals of food consumption rather than by intervals of income. The solid dots are identical to those in figures 1 and 2. The circled dots represent the group averages by intervals of food consumption. The two lines in figure 3 are regressions of family income upon food consumption. Again, line (1) is an unweighted regression, and line (2) is a weighted regression, which we prefer. In this case, lines 1 and 2 are almost identical. Either regression in figure 2 is practically the same as regression (2) in figure 1. In other words, if we are estimating expected family income associated with a given level of food consumption, we get about the same results from the group averages by intervals of food expenditures as we do by computing a regression based upon the original data. Again, the correlation between group averages is much higher than that based upon individual data. The weighted squared correlation based upon group averages in figure 3 is 0.78 compared with the squared correlation of 0.24 based upon the individual observations.

The results in figures 2 and 3 are typical. In general, if we group the data either by intervals of X or by intervals of Y, the correlations between the group averages will usually be substantially higher than those between the individual observations. On the other hand, the regression of Y on X is usually about the same whether it is based upon the individual

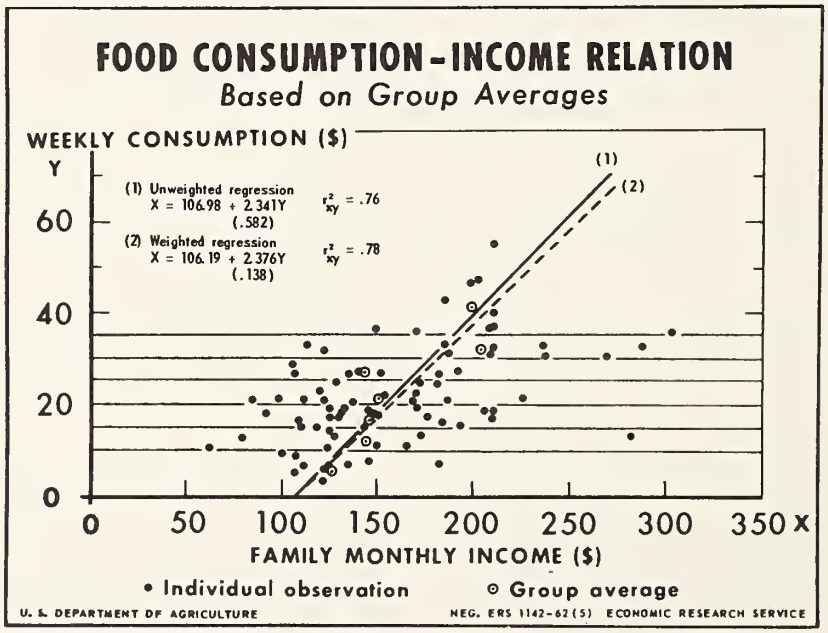

Figure 3

observations or upon averages of intervals of X. In a similar way, the regression of X on Y is about the same, whether it is based upon individual observations or upon group averages by intervals of Y.

Before leaving figures 2 and 3, we would like to make two general comments. First, we think it is always desirable to draw dot charts and to indicate group averages on the charts. In this way the researcher can see the nature of the data and can decide, for example, whether to fit a linear function or some type of curve. Methods of doing this have been discussed by Ezekiel (3, pp. 431-453) and also by Ezekiel and Fox (4, ch. 14). Second, we would emphasize that in any problem of two variables, say X and Y, there are always two regressions: the regression of Y upon X, and the regression of X upon Y. Each of these regressions has a definite meaning. If the researcher wants to estimate the expected values of Y associated with given values of X, he should group the data by intervals of X and vice versa.

RELATIONSHIPS BASED UPON TWO-WAY CLASSIFICATION

In figure 4 the data are classified into four intervals of family income, and each of these intervals is subclassified into four intervals of food consumption. In all, there are 16 subgroups or "cells." The circled dots indicate the averages of the items in each cell. We computed two regressions, using the cell averages as the observations. The solid line labeled (1) is the weighted regression of food expenditures upon family income. The dashed line labeled (2) is the weighted regression of family income upon food expenditures. Both of these lines in figure 4 are approximately the same as the corresponding lines in figure 1. For that reason the correlation is about the same. The squared correlation based upon the group averages in figure 4 is 0.30 compared with 0.24 in the case of the correlation based upon individual observations in figure 1.

When dealing with large numbers of observations, such as Census schedules for individual farms in the United States for example, we think it is often desirable to make a two-way classification like figure 4, and to work out group averages. This is somewhat similar to the "correlation tables" which were used so effectively by Yule and Kendall (9, ch. 11) to illustrate a wide variety of correlation and regression problems. The main difference is that Yule and Kendall simply counted the different observations in each cell and assumed that the group averages were at the centers of the cells.

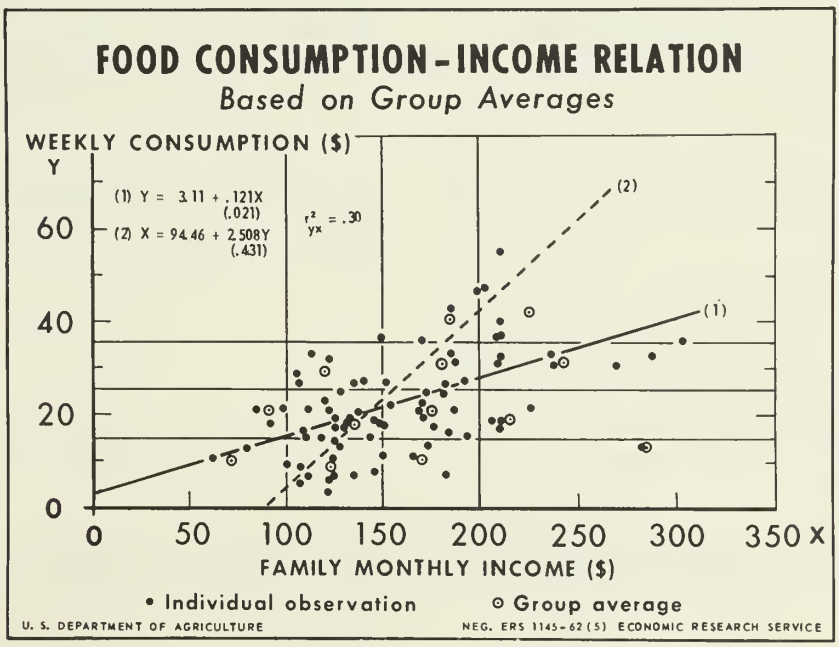

Figure 4

In the cases discussed by Yule and Kendall this made no significant difference. But, in principle, we think it is preferable to compute the group averages [5] as we have done and to show them in a dot chart like figure 4. When dealing with as few observations as in our example, this can make a substantial difference.

RELATIONSHIPS BASED UPON CLASS INTERVALS OF ANOTHER VARIABLE

Instead of classifying the data by intervals of family income or by intervals of food consumption, we might classify them by some other variable, such as size of family. This kind of problem often confronts any statistician who works with data that are grouped according to intervals of such factors as occupation, size of business, or geographical location. It is thus one of the problems underlying the so-called ecological correlations of the sociologist.

This problem is a little difficult to illustrate on a small chart. Instead we have taken the same data as those shown in figures 1 and 4, and have shown them in a series of diagrams in figure 5. For example, the little diagram in the top center shows only the dots for families of two persons. The diagram in the upper right-hand corner is a similar dot chart for families of three persons, etc. In each case, the horizontal and vertical lines represent the group means of food consumption and of family size. These group means are shown again in the final diagram which can be found in the lower right-hand corner. Using these group averages we find a weighted regression of food consumption on family income

$$Y = -14.30 + 0.15X \tag{2}$$

and the weighted squared correlation coefficient is 0.97. Both the regression and the correlation are higher than the corresponding regressions and correlations on the other charts.

[5] This is particularly true if wide class intervals are used. The wider the interval the greater the possibility that the average will not be centered in the cell.

Before giving a technical explanation for differences in regressions and correlations, we note that the main reason is that in this case family size is very highly correlated both with family income and with food consumption. These families were all getting some kind of public assistance, and the payments were based in large part upon family size. Those who were getting surplus foods also received amounts of food that were related to family size. This suggests that whenever we are interested in the relation between two variables, and use group averages based upon intervals of another variable, the results may be very different from the relationships based upon individual observations, especially in any case when the data are classified by another variable that is closely associated with either X or Y. For example, if we use State averages to study the relation between family income and food consumption, our results would be affected by the fact that there are substantial differences in average family income in different States.

An Explanation

We have already indicated that the results found in the particular example are fairly typical. When the data are grouped in ways similar to those in figures 2, 3, and 5, we can generally expect that the correlations between the group averages will be substantially higher than the correlations between the individual observations.

The general idea is very simple. Let us assume that the regression of Y upon X is linear. Let y and x be deviations of Y and X from their respective means. Then

$$\begin{aligned} y &= (Y - \bar{Y}) \\ x &= (X - \bar{X}). \end{aligned} \tag{3}$$

We can calculate the regression lines

$$\begin{aligned} y &= b_{yx}x \\ x &= b_{xy}y; \end{aligned} \tag{4}$$

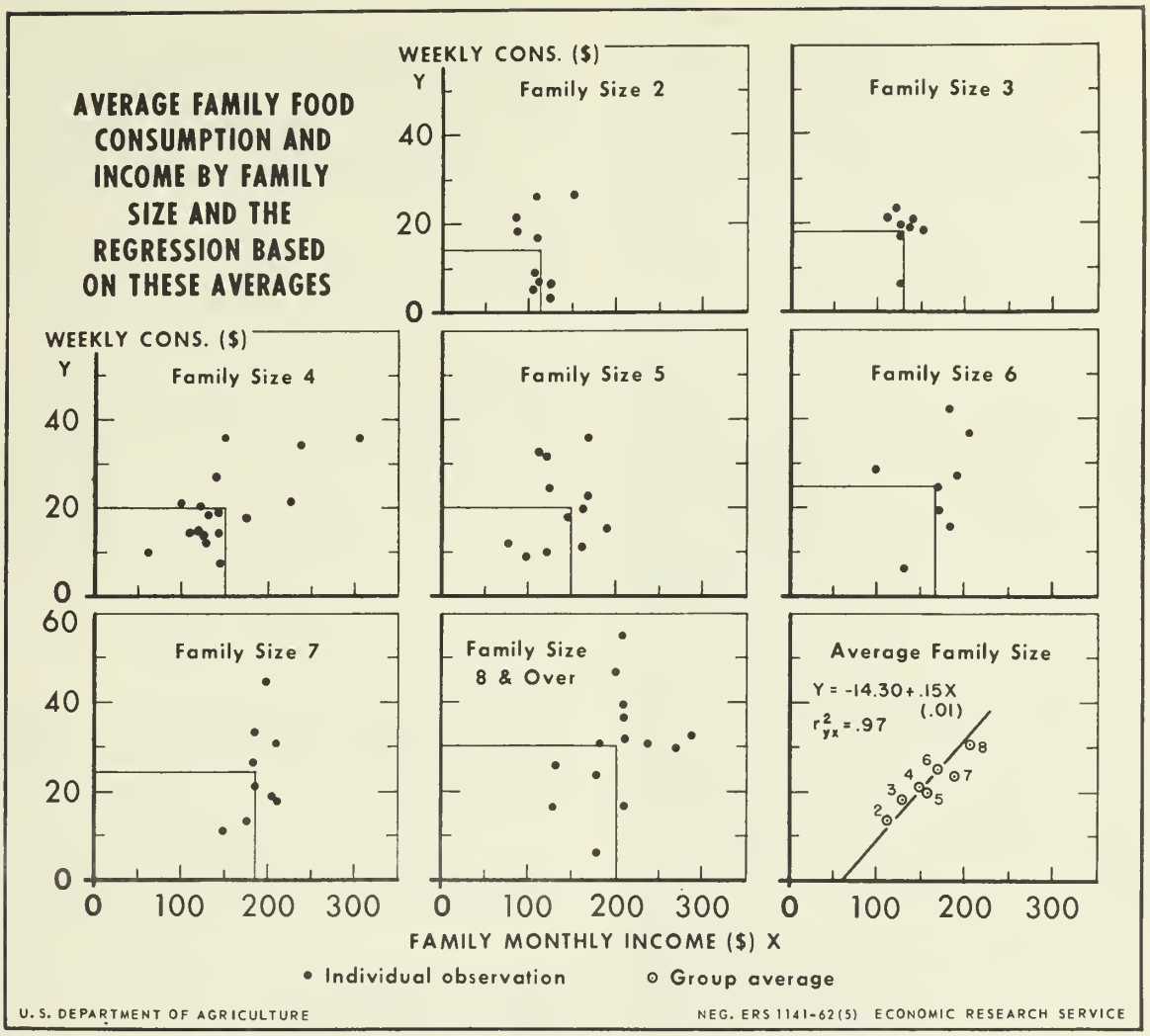

Figure 5

the standard deviations of y and x, S_y and S_x; and the correlations between the two variables

$$r_{yx} = b_{yx}\frac{S_x}{S_y}$$

(5)

$$r_{xy} = b_{xy}\frac{S_y}{S_x}.$$

To understand the difference between correlations based upon group averages and those based upon individual observations, we must center our attention on the standard deviations, S_x and S_y. The process of averaging by groups always reduces these standard deviations--but usually not in the same proportions. This can be seen clearly in figures 2 and 3.

For example, compare the standard deviations of the group averages shown in figure 2 with the standard deviations of the individual observations. The process of averaging by intervals of family income reduced the standard deviations of food consumption very substantially, while it did not change the standard deviation

of family income significantly. The reverse is true in figure 3. When the data are classified by intervals of food consumption, the process of averaging greatly reduces the standard deviation of family income without changing the standard deviation of food consumption very much.

Thus, in figure 2 the ratio, S_x/S_y, is greatly increased by the averaging process by reducing S_y relative to S_x. In figure 3, on the other hand, the averaging process greatly increases the ratio, S_y/S_x. We have already pointed out that the regression of X upon Y in figure 3 is approximately the same as the regression marked (1) in figure 1, and that the regression of X upon Y in figure 3 is approximately the same as the regression marked (2) in figure 1. The essential reason for the higher correlations in figures 2 and 3 is that the averaging process raised the ratios of the standard deviations, while leaving the regression coefficients about the same.

The process of group averaging illustrated in figure 4 was different. In this case the data were classified both by class intervals of family income and by class intervals of food consumption. The process of averaging in this case did not change the regressions significantly, as can be seen by comparing the two regressions in figure 4 with those in figure 1. Of course, the averaging process did reduce the standard deviations, but the reduction was about the same in the X direction as in the Y direction. Thus, the ratio of standard deviations was not changed significantly. With approximately the same regressions and the same ratio of standard deviations, we get approximately the same correlation coefficients--in this case with group averages as with individual observations.

We can demonstrate mathematically the effects of group averages on the regression and correlation coefficient. Let x_1 and y_1 denote the means of the various groups of x and y, and x_2 and y_2 be the deviations of the individual x's and y's from their respective group means. Thus,

$$x = x_1 + x_2$$
$$y = y_1 + y_2 . \tag{6}$$

We proceed to compute the individual regressions, $b_{yx(ind)}$ and $b_{xy(ind)}$. These are

$$b_{yx(ind)} = \frac{\Sigma yx}{\Sigma x^2} = \frac{\Sigma x_1 y_1 + \Sigma x_2 y_2}{\Sigma x_1^2 + \Sigma x_2^2}$$
$$b_{xy(ind)} = \frac{\Sigma xy}{\Sigma y^2} = \frac{\Sigma x_1 y_1 + \Sigma x_2 y_2}{\Sigma y_1^2 + \Sigma y_2^2} \tag{7}$$

where

$$\Sigma x_1 x_2 = \Sigma y_1 y_2 = \Sigma x_1 y_2 = \Sigma x_2 y_1 = 0, \tag{8}$$

exactly.

The group regressions based on group means are

$$b_{yx(gr)} = \frac{\Sigma y_1 x_1}{x_1^2}$$
$$b_{xy(gr)} = \frac{\Sigma x_1 y_1}{\Sigma y_1^2}. \tag{9}$$

We can call $\frac{\Sigma y_1 x_1}{\Sigma x_1^2}$ and $\frac{\Sigma x_1 y_1}{\Sigma y_1^2}$ the regressions between groups and $\frac{\Sigma y_2 x_2}{\Sigma x_2^2}$ and $\frac{\Sigma x_2 y_2}{\Sigma y_2^2}$ the regressions within groups. The individual regressions will be greater than, equal to, or less than the group regressions depending upon whether the regressions within groups are greater than, equal to, or less than the values of the regressions between groups. That is,

$$b_{yx(ind)} \gtreqless b_{yx(gr)} \quad \text{if} \quad \frac{\Sigma y_2 x_2}{\Sigma x_2^2} \gtreqless \frac{\Sigma y_1 x_1}{\Sigma x_1^2}$$
$$b_{xy(ind)} \gtreqless b_{xy(gr)} \quad \text{if} \quad \frac{\Sigma x_2 y_2}{\Sigma y_2^2} \gtreqless \frac{\Sigma x_1 y_1}{\Sigma y_1^2}. \tag{10}$$

In many cases, we would expect the slopes of the regressions within groups to be about the same as those between groups. In such cases, the regressions based on individual observations would be about equal to the regressions based on group averages. This was true in our example when we grouped by intervals of X, by intervals of Y, and by intervals of X and Y.

When we grouped by size of family, however, the regressions of Y on X within groups were substantially smaller than that between groups. For that reason the individual regression was significantly less than the group regression.

The individual squared correlation is

$$r^2_{xy(ind)} = b^2_{yx(ind)} \frac{\Sigma x^2}{\Sigma y^2} = b^2_{yx(ind)} \frac{\Sigma x_1^2 + \Sigma x_2^2}{\Sigma y_1^2 + \Sigma y_2^2}$$

(11)

$$= b^2_{xy(ind)} \frac{\Sigma y^2}{\Sigma x^2} = b^2_{xy(ind)} \frac{\Sigma y_1^2 + \Sigma y_2^2}{\Sigma x_1^2 + \Sigma x_2^2}$$

while the group correlation is

$$(12) \quad r^2_{xy(gr)} = b^2_{yx(gr)} \frac{\Sigma x_1^2}{\Sigma y_1^2} = b^2_{xy(gr)} \frac{\Sigma y_1^2}{\Sigma x_1^2}.$$

Thus, the major difference between $r_{xy(ind)}$ and $r_{xy(gr)}$ is in the ratios of variances of X to those of Y. As we have shown in our example, these ratios are often changed markedly by grouping, and in a predictable direction.

From (11) and (12) it follows that the relationship between the group and individual correlation coefficients will be

$$r^2_{xy(gr)} \lessgtr r^2_{xy(ind)}, \text{ or}$$

$$(13) \quad b^2_{yx(gr)} \frac{\Sigma x_1^2}{\Sigma y_1^2} \lessgtr b^2_{yx(ind)} \frac{\Sigma x^2}{\Sigma y^2}, \text{ or}$$

$$\frac{b^2_{yx(gr)}}{b^2_{yx(ind)}} \lessgtr \frac{\dfrac{\Sigma x^2}{\Sigma y^2}}{\dfrac{\Sigma x_1^2}{\Sigma y_1^2}}.$$

In general we would expect the correlation coefficient based on group averages to be larger than the one based on individual observations. However, it does not always have to be this way. A simple example shown in figure 6 will suffice to illustrate the reverse situation. The example is constructed so that the slope of the regression line within each group is the same as the one between groups. Each individual observation and each group average are the same vertical distance from the regression line. The process of averaging reduces the variance of X more than it reduces the variance of Y. The regression coefficient remains unchanged. It follows, then, from (13) that $r^2_{yx(gr)}$ would be less than $r^2_{yx(ind)}$. One, of course, could also illustrate this same point with an example that appeared less extreme.

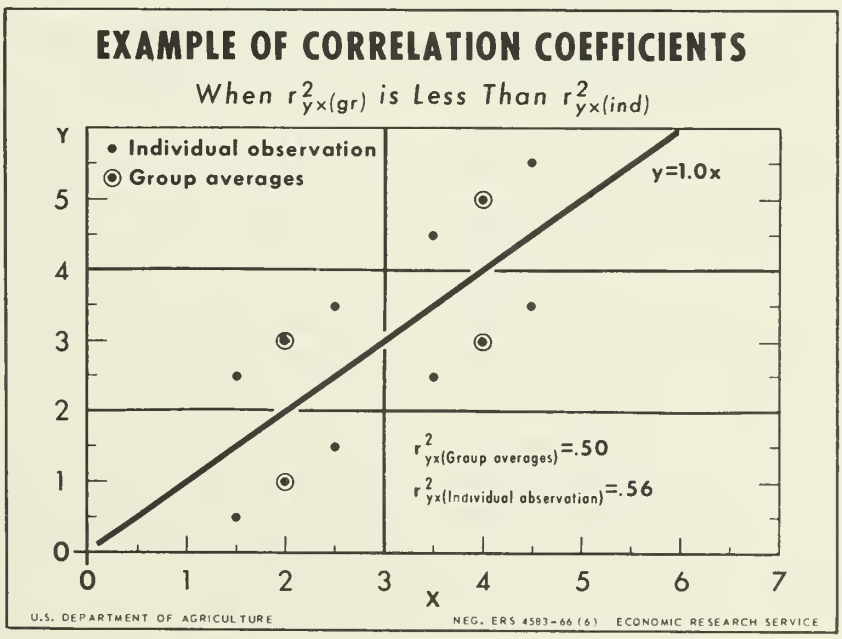

Figure 6

One purpose of using group averages is to reduce the labor of computation. This apparently was one of the main purposes of Yule and Kendall. Even in these days of automatic computation, there may be significant savings in time and cost by using group averages. In addition, graphical presentations of the data are simplified when group averages are used. And, if our purpose is to estimate the regressions and correlations based upon the individual observations, we recommend a two-way grouping, such as that used so effectively by Yule and Kendall, and such as we have illustrated in figure 4.

Of course, some judgment is needed in determining the class intervals in each direction. We suggest that there should be roughly the same number of class intervals in either direction, and that the intervals be so chosen as to give a reasonable number of observations in each cell.

The situation illustrated by figure 5 is a little different from those in figures 2, 3, and 4. In the case illustrated by figure 5, the data were first grouped by size of family. For each family size we computed averages of family income and family food expenditures. The relation between these group averages is shown in the bottom right-hand corner.

In this case the squared correlation was raised to 0.97 (compared to 0.24 in the case of individual observations). The correlation was raised in two ways. First, the process of averaging greatly reduced the standard deviations. Second, it also increased the steepness of the regression of Y upon X.

This kind of situation is likely to occur in any case where the data are grouped by intervals of a third variable which is closely related to X, to Y, or to both X and Y. In our case, illustrated by figure 5, the size of family is closely related both to family income and to family food consumption. This is especially true since these families were on relief, and relief payments (including donated foods) were based partly upon family size. When we group by family size and get the relation between group averages of family income and family food expenditures, we are really dealing with a three-variable problem; that is, food consumption is affected not only by family income, but also by family size. The regression line shown in the lower right diagram in figure 5 and the associated correlation coefficient actually combine the effects of family income and family size upon food consumption.

The data presented in figure 5 were used in a three-variable problem. The estimated regression equation is

$$Y = 4.28 + \underset{(0.026)}{0.066}X + \underset{(0.547)}{1.379}Z \tag{14}$$

where Z is family size. The squared multiple correlation coefficient is 0.29. The squared simple correlation coefficient between Y and Z is 0.23 and between X and Y is 0.36. However, the squared simple correlation between group averages of X and Y, classified by size of family, is 0.97. It can readily be seen that widely different results are obtained when the data are grouped by intervals of a third variable and when the third variable is used in a multiple regression and correlation problem. Notice also that the coefficient of income is lower than in the regression of consumption on income based on individual observations. This is not unreasonable since in the three-variable problem the coefficient of X is net of changes in family size, whereas in the two-variable case based on individual observations, the effect of family size was not accounted for.

If we are interested in the gross relationship between consumption and income, the results from the two-variable problem are appropriate, even though these results are due in part to the effects of family size. If, however, we are interested in the relation between consumption and income net of family size, then the results from the three-variable problem are appropriate and the regression coefficient from the two-variable problem based on individual observations is biased. If the omitted variable is positively correlated with the independent variable, as is the case in our problem, then the coefficient of the independent variable is biased upward (5, pp. 8-20). This we readily see from our analysis.

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Interpretations of Economic Evidence: The Report of the National Commission on Food Marketing

By Alden C. Manchester

EACH MAN--whether he be economist, businessman, or man of public affairs--looks at economic evidence from a different vantage point and draws his own unique set of conclusions. It would be surprising if this were not so. Nowhere is this more clearly seen than in the work of a bipartisan commission where opposing views are firmly held and vigorously expressed.

The National Commission on Food Marketing was established in late 1964. Funds and staff were available and it began work in January 1965. It consisted of 15 members--5 Senators appointed by the President Pro Tempore of the Senate, 5 Congressmen appointed by the Speaker of the House of Representatives, and 5 public members appointed by the President. Its Chairman was Phil S. Gibson, retired Chief Justice of the Supreme Court of California. The Executive Director was George E. Brandow, Professor of Agricultural Economics at Pennsylvania State University.

The Commission's duties were to "study and appraise the marketing structure of the food industry," including recent and prospective changes in the food industry, and "the kind of food industry that would assure efficiency of production, assembly, processing and distribution, provide appropriate services to consumers, and yet maintain acceptable competitive alternatives of procurement and sale in all segments of the industry from producer to consumer." It was also to appraise "the changes in statutes or public policy, the organization of farming and food assembly, processing, and distribution and the interrelationships between the segments of the food industry which would be appropriate to achieve a desired distribution of power as well as desired levels of efficiency," and "the effectiveness of the services, including the dissemination of market news, and regulatory activities of the Federal Government, in terms of present and probable developments in the industry."

The final report of the Commission is now available.[1] Ten technical reports are being printed at the time of this writing and should be available before this article appears in print.

The basic concept of the Commission was that it would be a little TNEC for the food industry, modeled on the Temporary National Economic Committee of the late 1930's and early 1940's. The approach both in the legislation and in the report is structural. The key questions are: What is the present organization of each of the major food industries? How has it changed in the postwar period? What further changes can be expected? What is the nature of competition in these industries, and does it constitute "workable competition"? And, finally, what changes in public policy would contribute to making competition more nearly workable?

The Commission held public hearings on subjects ranging from the poultry industry to consumer problems, at which witnesses from trade organizations, farm organizations, consumer-oriented organizations, and Government agencies, as well as individual businessmen and farmers, testified. The basic materials for the Commission's study were derived from the work of its staff. The Department of Agriculture, the Federal Trade Commission, and the Bureau of the Census undertook numerous lines of research or special tabulations for the Commission. Many economists from land grant colleges carried out special projects. Much of the data necessary to the work of the Commission was collected through surveys of

[1] "Food from Farmer to Consumer." Report of the National Commission on Food Marketing, June 1966, 203 pp.

various portions of the food industry; some through formal interviews with representatives of major firms in the various industries.

The report of 203 pages contains 90 pages of findings, including 7 chapters on individual industries, 1 on marketing margins, and 1 on economic regulation. The majority appraisal and conclusions comprise 24 pages, and individual and minority views 76 pages. The 7 chapters dealing with individual industries are rather brief summaries of the forthcoming technical studies. There are chapters on livestock and meat, poultry and eggs, dairy products, fruits and vegetables, milling and baking, grocery manufacturing (primarily breakfast cereals, crackers, and cookies), and retailing. Each chapter treats market structure in terms of number and size of firms, making considerable use of measures of concentration, that is, the proportion of goods in a given market supplied by individual firms. Most deal also with vertical and horizontal integration, and with mergers and acquisitions. Conduct of each part of the food industry is dealt with fairly briefly in most chapters. Performance is discussed in terms of margins and profits and, in some chapters, promotional expenditures. These brief summaries obviously contain only a few of the highlights included in the technical reports. An evaluation of the staffwork will have to wait for publication of these technical reports.

The work of the National Commission on Food Marketing does not provide all the answers to the questions posed in its charter. The 18 months available to the Commission, and its respectable but not overwhelming budget, limited the nature and extent of its inquiries. Within these limits, the Commission--and particularly its staff--has done a very creditable job. The major factors affecting the development of the food industry are all here.

The differences between the majority and minority views of the Commission--and to a lesser extent within these groups--as to the conclusions to be reached regarding desirable public policy emphasized the tenuous link between the findings of economic studies and policy conclusions. Both majority and minority were agreed in their praise of the staffwork and economic evidence presented. While there was general agreement on the "facts," there was almost total disagreement on the importance and meaning of these "facts" and their implications for public policy.

Both majority and minority groups agreed that substantial changes had occurred in the food industry since World War II. With a few exceptions, the minority felt that these changes were beneficial and should be encouraged. Competition should be viewed in terms of a vigorous struggle for shares in the market. Such competition meets requirements of the antitrust laws and, hence, is in accord with desirable public policy. The American consumer demanded the great increase in variety of products and services of the last 20 years and has been well served by them.

The majority opinion was that competition should be viewed largely in structural terms. Public policy should resist further concentration in a market by individual firms because this condition would lead to poor performance. Regulatory agencies should, therefore, be given additional powers to prevent mergers in the food industry. To strengthen the bargaining power of farmers, the majority supported greater use of cooperatives and marketing orders, and a new device termed an Agricultural Marketing Board which would combine features of a cooperative and a marketing order with additional powers not now possessed by either. While consumers have not resisted, and in many cases have welcomed, the proliferation of products and services, these were primarily generated within the food industry as merchandising tools. They cannot be regarded as universally contributing to the public welfare. The nonphysical side of the marketing system should be regarded as a communication system and public policy should be bent toward improving the information available to all the participants in the system so that more rational choices become possible. To this end, the majority recommended increased grade labeling of consumer products, Food and Drug Administration standards of identity for many more consumer products, restriction on the proliferation of package sizes, and other measures to permit the consumer to make more rational choices. The minority regarded these recommendations as an infringement upon the rights of marketing firms.

Other recommendations of the majority were directed toward providing better data with which to appraise the performance of the food marketing industries. These included better measures of retail prices collected by the Bureau of Labor Statistics and used by the Department of Agriculture in calculating farm-to-retail price spreads, and separate reporting of lines of business of large conglomerate corporations. The problem of reflecting the effects of price specials on average prices paid by consumers, especially for meat, has long been recognized by both the originators and the users of these data.

As food manufacturing firms continue to diversify and extend their activities into an ever-widening variety of business lines both within and without the food industry, data on costs, margins, and profits on a company basis become less and less useful as measures of performance. The Food Commission's recommendations, if enacted into law, would provide a valuable tool for the analysis of the performance of specific industries. The Securities and Exchange Commission is studying such a move for all firms under its jurisdiction.

The conclusions of the Food Commission--both the majority and the minority--as to needed changes in legislation and administration are stated quite explicitly. The implementation or nonimplementation of these needed changes is largely outside the scope of the agricultural economics profession. The implications of the Food Commission's work for research are less explicitly stated. Inevitably with any broad view of agricultural marketing, the Food Commission's work stresses the necessity of considering the interrelationships between all of the segments of the system. Once again, it emphasizes the role of data on prices and price spreads as measures of industry performance and the continuing need to improve these measures for the specific purpose of judging performance. Not that prices and price spreads are the sole measure of performance. Measures of other aspects must be developed and refined to permit better evaluation of the effectiveness of the marketing system in serving the economy.

The emphasis both in the charter and in the report of the Food Commission is on the maintenance of alternative outlets for farmers and marketing firms, and of alternative sources of supply for marketing firms. These are regarded as crucial aspects of the organization of the marketing system with marked impacts upon performance. The Commission does not say that the maintenance of large numbers of competitors at every level is an objective to be sought above all others. It does say that our research must devise ways of evaluating realistically the alternatives available over time so that more meaningful conclusions can be reached as to changes in the actual state of competition.

Population Growth and Agricultural Development[1]

By Raymond P. Christensen

AGRICULTURE'S SHARE of total population declines with economic development. Farm-to-city migration takes place as countries move up the income ladder. A declining share of the total labor force is employed in agriculture (fig. 1). As per capita incomes rise, people spend a smaller share of their income for farm products and a larger share for other things. Shifts in the structure of demand for products and services cause fewer workers to be employed in agriculture and more in other sectors.

But agricultural population will continue to increase for another generation or two in the less developed countries. Agricultural population may double in some countries in the next 30 to 40 years, even though agriculture's share of total population decreases. Population growth rates in most of the less developed countries now are relatively high, 2 to 3 percent a year or more. This, together with the fact that agriculture now accounts for a large share of total employment in these countries, means that nonagricultural employment would need to increase 10 to 15 percent a year to absorb all of the net increase in number of workers. Yet employment opportunities in nonagricultural sectors cannot be expected to increase more than 4 to 5 percent a year. Of course, productivity per worker in agriculture must also increase before it will be possible for agriculture to release workers to the nonagricultural sectors.

Prospects for continued growth of agricultural population and labor force in the developing countries have important implications for agricultural development planning, especially in densely populated countries where opportunities for expanding the land area under cultivation

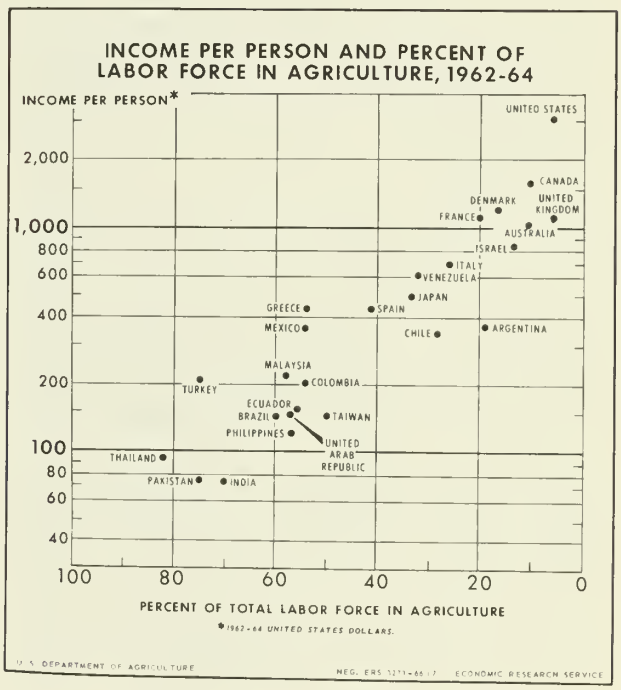


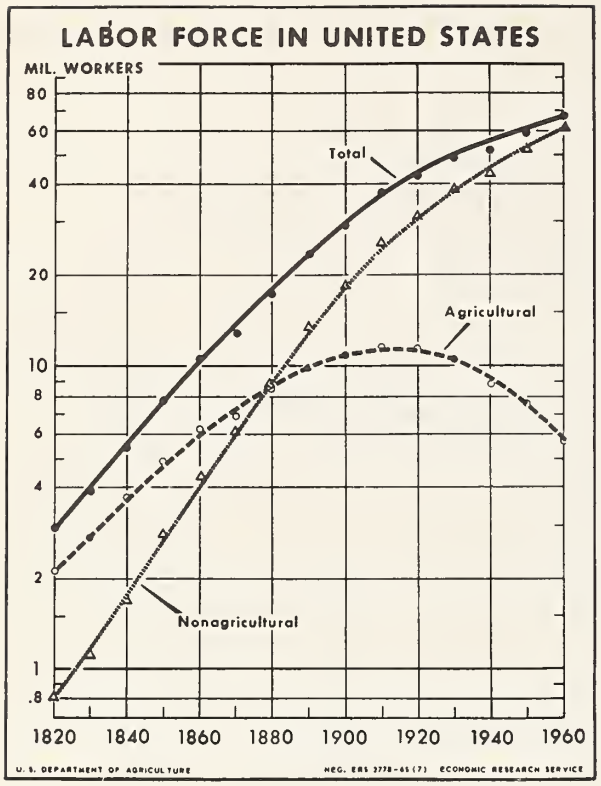
Figure 1

are limited. Several questions should be faced. How can additional farmworkers be employed effectively? How can production per farmworker be increased at the same time that land available per worker decreases? Should farms be reduced in size or should additional people be employed as hired workers?

Professor Folke Dovring called attention several years ago to the growth of farm population during the early stages of economic development (2).[2] But relatively little attention has been given in agricultural development plans to the problems of finding productive employment for increasing numbers of farm

[1] Revision of a paper presented at seminar of faculty and graduate students, Department of Agricultural Economics, Cornell University, May 2, 1966.

[2] Underscored numbers in parentheses refer to items in the Literature Cited, p. 128.


LABOR FORCE IN UNITED STATES
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Total
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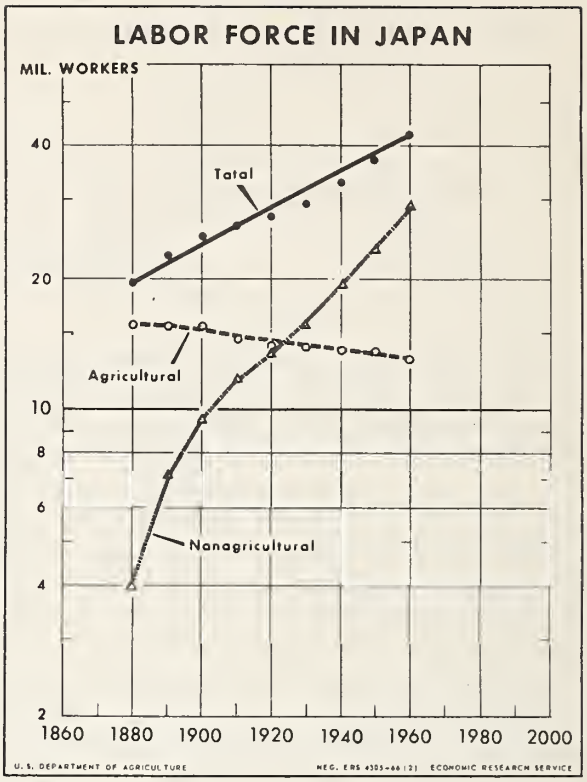
ECONOMIC RESEARCH SERVICE


LABOR FORCE IN JAPAN
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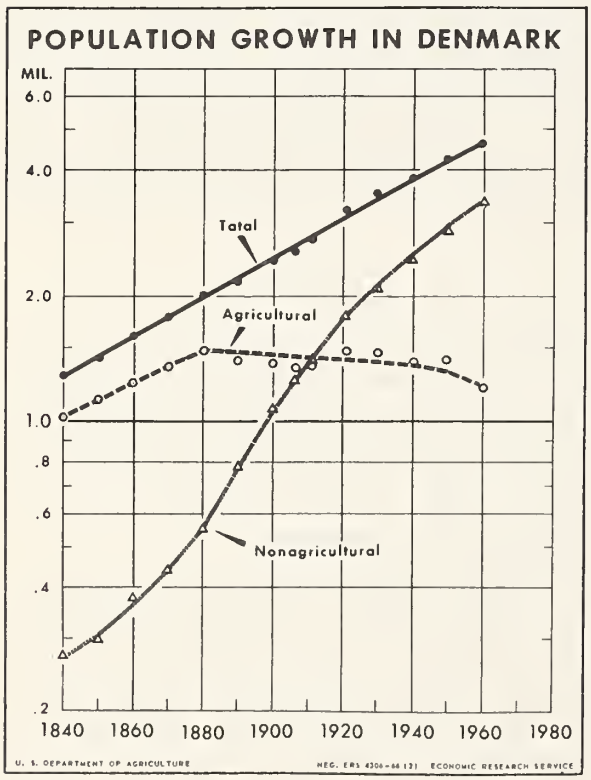
ECONOMIC RESEARCH SERVICE


POPULATION GROWTH IN DENMARK
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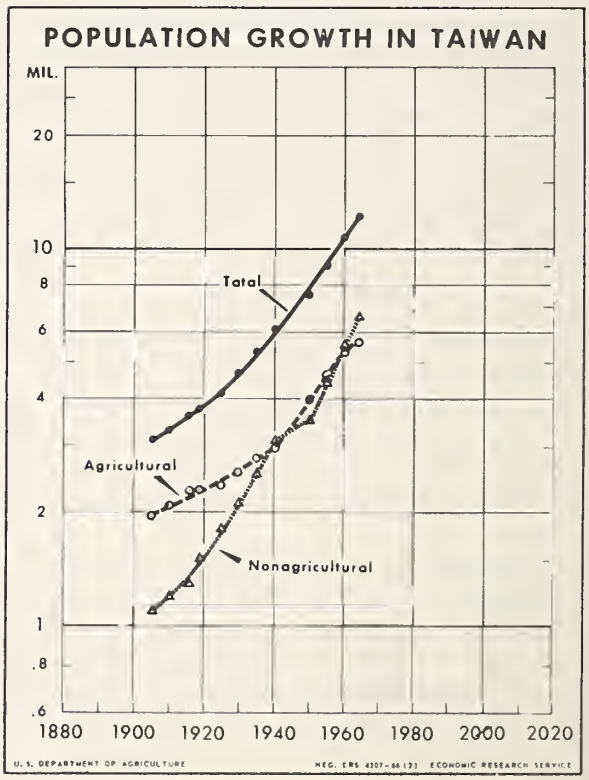
ECONOMIC RESEARCH SERVICE


POPULATION GROWTH IN TAIWAN
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Total
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Nonagricultural
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2000
2020
U. S. DEPARTMENT OF AGRICULTURE
ECONOMIC RESEARCH SERVICE

Figure 2

people or to problems of farm size and structural organization of farming in the developing countries.

Population Growth Patterns

Historical growth patterns for the agricultural and nonagricultural parts of the labor force and population in the United States, Denmark, Japan, and Taiwan suggest what may happen to growth in numbers of people directly dependent upon farming for a livelihood in the less developed countries (fig. 2).

The growth pattern for the United States may be representative of what might be expected in some developing countries. Agriculture's share of the total labor force was 72 percent in 1820, and it declined to 49 percent in 1880 (table 1). The total labor force increased 3.1 percent a year during this period. The agricultural labor force increased 2.3 percent a year and the nonagricultural labor force 4.1 percent a year. Agricultural employment increased about threefold, from a little over 2 million in 1820 to a little over 8 million in 1880. It continued to increase until about 1910, when it was a little over 10 million, before it began to decline.

Japan and Denmark are often referred to as countries that achieved outstanding progress in agriculture during the early stages of economic development. Data for these countries show that much hinges upon total population growth rates. Both countries made the transition from over 70 percent of total population or employment in agriculture to 49 percent in a period of about 35 years (table 1). But in both countries population increased only 1 percent a year or less. In Denmark agricultural population increased slightly during the transition period, while in Japan, where the total labor force increased only 0.7 percent a year, the agricultural labor force decreased slightly. However, agricultural population is now increasing much more rapidly in the less developed countries than it did in Denmark or Japan during the early stages of their economic development.

Taiwan's experience in the last 50 years may be representative of many developing countries where population growth rates are relatively high. Agriculture's share of total employment decreased from 64 percent in 1908 to 50 percent in 1938. It increased during World War II but it has decreased to less than 50 percent in the last few years. If we include in agriculture people employed in forestry and fisheries, agriculture's share of total population decreased from 69 percent in 1930 to 56 percent in 1956 (table 1). During this period, total population increased 2.7 percent a year. The population of Taiwan has increased 3 percent or more annually in the last few years but may now be

Table 1.--Estimates of agriculture's share of total employment and rates of growth in employment or population during early periods of development, selected countries [1]

Country	Period	Agriculture's share of total employment		Compound growth rates in employment or population		
		Beginning of period	End of period	Total	Agricultural	Nonagricultural
	Years	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
United States.....	1820-1880	72	49	3.1	2.3	4.1
Denmark.....	1880-1911	72	49	1.0	([2])	3.0
Japan.....	1885-1920	73	49	.7	([3])	2.5
Taiwan.....	1930-1956	69	56	2.7	1.9	4.1

[1] Computed from following sources: United States--Statistical Abstract (11); Denmark--Danish Agriculture (5); Japan--Agricultural Development (7); Taiwan--data supplied by Joint Commission for Rural Reconstruction (data for Taiwan include workers in forestry and fisheries).

[2] Little change.

[3] Slight decrease.

beginning to decline. However, the total agricultural labor force probably will continue to rise for the next 10 to 20 years.

If we use change in agriculture's share of total employment as an indicator of economic development, it is evident that most developing countries show progress during the last 20 or 30 years. Agriculture's share of total employment has decreased in nearly all countries, according to data reported by the Food and Agriculture Organization (table 2). Indonesia apparently is an exception. In several countries agriculture's share of the total labor force has decreased 5 to 10 percent in the last 20 or 30 years. However, in India, Pakistan, Thailand, the Philippines, Brazil, Colombia, and many other countries, agriculture still accounts for 60 percent or more of total employment.

Better data on agricultural and nonagricultural employment obviously are needed. But available data show that in many countries nonagricultural employment has increased more than twice as rapidly as agricultural employment. However, nonagricultural employment growth rates of more than 4 percent a year have not been achieved over an extended period of time by many countries.

Puerto Rico made the transition from 67 percent of total employment in agriculture in 1931 to 31 percent in 1962. Nonagricultural employment increased 3.3 percent a year during that period, while agricultural employment decreased about 1 percent a year. Total employment increased only 1 percent a year. The natural rate of population growth was higher than 1 percent a year but many people migrated to the continental United States.

Future Growth Patterns

What can one conclude about future growth in population or labor force directly dependent upon agriculture for a livelihood? Much depends upon how rapidly total population increases. Population growth rates have gone up rapidly

Table 2.--Percentage of total employment in agriculture and estimates of annual growth rates in employment, selected countries [1]

Countries	Period	Percentage in agriculture		Annual growth rates in employment		
		Beginning of period	End of period	Total	Agriculture	Nonagriculture
	Years	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Japan	1930-60	41	26	1.2	-0.3	2.0
United Arab Republic	1937-60	69	58	1.4	.6	2.8
Philippines	1939-62	75	66	1.9	1.3	3.0
India	1931-61	70	65	1.6	1.5	1.7
Pakistan	1961	--	73	--	--	--
Indonesia	1930-61	68	73	1.4	1.7	.8
Turkey	1935-60	73	61	2.0	1.4	3.5
Thailand	1937-60	84	78	3.0	2.7	4.4
Brazil	1940-50	69	66	2.2	1.6	3.3
Chile	1940-60	44	34	1.7	.4	2.5
Colombia	1938-51	70	63	1.6	.8	3.3
Peru	1940-61	66	55	2.0	1.1	3.5
Mexico	1940-60	65	55	2.7	1.9	4.2
Puerto Rico	1930-62	67	31	1.0	-1.0	3.3

[1] Computed from data on active population and population engaged in agriculture (males) reported in FAO Production Yearbook (8).

in the less developed countries in the last 15 years. During the first 50 years of this century, population increased less than 1 percent a year in Asia and less than 2 percent a year in Latin America. But in the last few years population has increased over 2 percent a year in most countries in Asia and over 3 percent a year in most countries in Latin America.

The application of modern health and disease control measures has reduced annual death rates from over 40 per 1,000 of total population to 10 to 20 per 1,000 in many countries. Meanwhile, birth rates have continued high at around 40 per 1,000 each year. As a result, populations have grown at rates of 2 to 3 percent a year. Young people now account for a large share of the total population of the developing countries. Consequently, these countries probably will continue to have high birth rates for the next 20 to 30 years.

India's experience during recent decades is typical of many developing countries. Total population increased only 5 percent during the 30 years from 1891 to 1921, or only one-sixth of 1 percent a year (1). However, population increased 44 percent during the next three decades, or over 1 percent a year. Birth rates continued high at about 45 per 1,000 of total population from 1891 to 1951, while death rates declined from 41 to 31 per 1,000. Since 1951, death rates have continued to fall while birth rates have remained high. Consequently, population growth in India now exceeds 2.5 percent a year.

In Taiwan total population increased less than 2 percent a year from 1905 to 1940, but it has increased more than 3 percent a year since 1950 (fig. 2).

According to estimates of the United Nations, world population will grow 2.1 percent a year between now and 1975 and 2.6 percent a year between 1975 and the year 2000. These estimates are world averages; population growth rates for the less developed countries are higher. The 1964 Demographic Yearbook of the United Nations reports annual population growth rates during 1958-63 of 2.9 percent for Turkey, 3.0 percent for Thailand, 3.2 for the Philippines, 3.1 for Brazil, 3.2 percent for Mexico, and 4.5 for Costa Rica. Of course, programs to limit population growth may be expanded and become more effective. However, even with effective population control programs, it seems likely that population will increase 2.5 percent a year between now and the year 2000, more than doubling the numbers in many developing countries.

For illustrative purposes we may assume for a typical developing country that 70 percent of the total population is agricultural. Let us also assume that, between now and the year 2000, total population increases 2.5 percent a year and nonagricultural population increases 4 percent a year (table 3). In this case,

Table 3.--Projected growth rates for population and agricultural production in a typical developing country, 1965 to 2000

Item	Annual growth rate	Year		Percentage increase
		1965	2000	
Population:	*Percent*	*Million*	*Million*	*Percent*
Total	2.5	100	237	137
Nonagricultural	4.0	30	119	296
Agricultural	1.5	70	118	68
Agricultural production:		*Percent*	*Percent*	
Total [1]	3.1	100	291	191
Per hectare	3.1	100	291	191
Per farm worker	1.6	100	173	73

[1] Total agricultural production projected to meet increase in economic demand, assuming annual income growth of 1 percent per person and income elasticity of demand for farm products of 0.6, in addition to population growth.

agricultural population would increase 1.5 percent a year. The country would make the transition from 70 percent to 50 percent of total population in agriculture by the year 2000. Total population would increase nearly 140 percent, nonagricultural population about 300 percent, and agricultural population nearly 70 percent. Population growth rates in many developing countries during the next 30 to 40 years may exceed the annual growth rate of 2.5 percent assumed here. Agricultural population of some countries may double before it begins to decrease, even though rapid economic development takes place.

Population Pressure on Land Resources

The developing countries in the next few decades will need much larger increases in agricultural production than those achieved in most of the now developed countries during the early stages of their development. In the case of the illustration referred to here, total agricultural production would need to increase 3.1 percent a year to meet economic demands resulting from population growth and slowly rising per capita incomes (table 3). If no additional land were available for cultivation, production per hectare would need to increase 3.1 percent a year, or nearly triple by the year 2000. In countries where population is increasing 3 percent or more annually, agricultural production must go up 4 to 5 percent a year to meet increasing demands for food resulting from population and income growth.

The increases in agricultural production required in European countries and in Japan, of course, were much smaller because population growth rates were only about 1 percent a year. Agricultural production did not need to increase more than about 1.5 percent a year to meet demands resulting from population and income growth. In the United States, Canada, and other newly settled countries, where population growth rates were around 3 percent a year during early stages of development, large areas of fertile land were available for cultivation. Agricultural production could be increased 4 to 5 percent a year by bringing additional land under cultivation.

Does rapid population growth in the densely populated low-income countries make economic development impossible? Do the small amounts of land and capital available per person limit development possibilities?

Japan is a country that achieved economic development with relatively few land resources. India and Pakistan usually are considered to be densely populated countries, but they now have 5 to 6 times as much arable land per person as Japan (table 4). However, land resources vary widely in quality. The potential productivity of arable land may not be as high in India and Pakistan as it is in Japan.

Countries like India, Pakistan, Thailand, and the Philippines appear to have enough land resources to feed the populations expected by the year 2000 if crop yields can be increased to levels now realized in Japan. Crop yields for rice now average about 3 times as large in Japan as those in most developing countries. But yields must go up much more rapidly than they did in Japan. During the 35 years from 1885 to 1920, when Japan made the transition from 72 percent to 49 percent of total population in agriculture, total agricultural production increased 120 percent or about 2 percent a year. And as has been pointed out, developing countries today will probably need annual increases in agricultural production of 4 to 5 percent.

The developing countries today may be in an advantageous position because they can utilize advanced agricultural technology from the developed countries. Certainly, the basic scientific principles are directly transferable. But some adaptation of production techniques now used in the developed countries, where average crop yields are relatively high, will be necessary before they can be applied to developing countries located mainly in tropical climates. However, the technological gap between known production methods that would increase crop yields and those that are currently being applied in tropical areas may be quite small.

Capital Requirements

Improved technology in agriculture requires the use of additional capital goods. In Japan, for example, inputs of working capital increased

Table 4.--Arable land per person and average size and number of workers per farm or holding[1]

Country	Arable land area per person		Average size of farm or holding[3]	Number of workers per farm or holding[2]
	Total population	Agricultural labor force[2]		
	Hectares	*Hectares*	*Hectares*	*Number*
Japan	0.06	0.42	1.2	2.0
Taiwan	.07	.58	1.2	1.6
Netherlands	.08	2.21	9.0	1.5
United Arab Republic	.09	.56	2.6	--
Peru	.15	1.15	--	--
Israel	.17	3.38	14.2	--
Indonesia	.17	.54	1.0	--
Brazil	.25	1.84	112.5	--
Pakistan	.26	1.13	2.4	1.9
Italy	.30	2.89	--	--
Colombia	.33	2.49	30.2	--
India	.35	1.24	3.0	--
Thailand	.35	1.04	4.4	--
Philippines	.37	1.90	3.5	--
France	.44	5.43	--	--
Ireland	.47	3.41	18.4	--
Mexico	.52	3.24	105.2	--
Denmark	.59	7.53	16.0	1.8
Chile	.67	8.51	183.6	--
Turkey	.86	2.30	7.7	--
United States	1.00	34.07	123.0	1.4
Argentina	1.38	20.53	366.2	--

[1] Data from Production Yearbook (8) and from World Agricultural Structure (9). Data on average size and number of workers per holding are for years around 1960 for Japan, Pakistan, Taiwan, Netherlands, Denmark, and the United States, and for years around 1950 for other countries.

[2] Male workers only.

[3] All land.

200 percent during 1885-1920 when agricultural production increased 120 percent. In Taiwan, inputs of working capital increased nearly 1.5 percent for each 1 percent increase in total agricultural output during the period from 1911-15 to 1956-60. Capital inputs accounted for only 11 percent of all inputs in 1911-15, but for 28 percent in 1956-60 (4). In the United States, capital inputs increased about 1.5 percent for each 1 percent increase in total agricultural output during 1870-1920 (6).

In most countries capital inputs probably will need to increase 4 to 5 percent a year to achieve annual increases in agricultural production of 3 percent. Most of these capital inputs will need to be supplied by the nonagricultural sectors. Fertilizer, pesticides, and other materials are especially needed to increase crop yields.

The developing countries have not reached the stage where large-scale substitution of capital for labor would be economic. Labor is abundant while capital and land resources are relatively scarce. However, greater use of machinery to improve land preparation and cultivation and to increase crop yields may be economic in some instances.

Abundant labor supplies can be a source of capital if used for such things as construction of roads and land-improvement projects. These

projects are especially useful in providing employment during seasons when labor is not fully occupied with farmwork.

Rapid population growth is a serious obstacle to growth in output per person. The capacity to save is reduced because a high proportion of the population is in the dependent age group (typically 60 percent as compared with 40 percent in the developed countries). At the same time, greater investment is required because a larger increase in gross national product is needed to provide a given increase in per capita income.

Enke has analyzed the economic aspects of slowing population growth (3). He concludes that resources used for birth control can be 100 times more effective in raising income per person than resources used in traditional development projects.

Most countries may have enough land resources and may be able to obtain enough additional capital so that, with improved technology, agricultural production can be expanded sufficiently to meet the food needs of expected population growth during the next 30 or 40 years. But population growth rates must decrease eventually if the world is to feed itself. Dr. Philip Hauser has pointed out that: "One hundred people multiplying at 1 percent a year for 5000 years of human history would have produced a contemporary population of 2.7 billion per square foot of land surface of the earth! Such an exercise in arithmetic, although admittedly dramatic and propagandistic, is also a conclusive way of demonstrating that a 1 percent increase in world population could not have taken place very long in the past; nor can it continue long in the future."[3]

Farm Size Problems

How will sizes of farms need to change as agricultural labor force increases? Questions relating to economies of scale will be very real in the future. Looking ahead 10 or 20 years, it should be possible to estimate at least approximately for each country how many people will depend upon farming for employment, how much land will be available for farming, and how much capital can be allocated for agricultural use. Should these resources be combined in small family-sized units, or should large farms employing 5, 10, or more workers be established? Policies influencing farm size and structural organizations in agriculture will affect income distribution as well as the efficiency of farm production.

Experience in the United States, Japan, and other developed countries does not provide much guidance on how sizes of farms need to change as total labor force increases. The United States brought large areas of land into cultivation during the years when its agricultural population was increasing. In fact, total area of cropland increased along with agricultural population until about 1915. Cropland area per farmworker increased slightly. Total cropland area in the United States has not changed much since 1920, but with the decline in farm employment in recent years, cropland per farmworker has gone up greatly. Sizes of farms have also increased. Similar trends have taken place in Canada, Australia, and New Zealand where population growth was rapid during early stages of development.

In Japan, where agricultural employment remained relatively stationary during the transition period 1885–1920, cropland per worker did not decrease. Little change in average size of farm or in the size distribution of farms took place. Most farms in Japan remained small with land distributed quite evenly among farmworkers.

In most West European countries where population increased only 1 percent a year and agricultural population remained stationary or decreased slightly during early stages of development, cropland per farmworker did not change greatly. However, several European countries had land reforms that involved breaking up large estates into small family-size units.

In Puerto Rico the farm labor force decreased about 1 percent a year during 1930–62, while agriculture's share of the total labor force declined from 67 percent to 31 percent. Cropland per farmworker increased. Thus, sizes of farms could be expanded without increasing the number of workers per farm.

[3] Quoted in: Joseph M. Jones, Does Overpopulation Mean Poverty?, Center for International Economic Growth, Washington, D.C., 1962.

In countries like India, Pakistan, Turkey, the Philippines, Thailand, and Egypt where not much additional land is available for settlement, farms will need to decrease in size, or the number of workers per farm will need to increase, to provide employment for the expected rise in farm labor force. Information about farm size structure is incomplete. However, data compiled here from publications of the Food and Agriculture Organization indicate that farms in India, Pakistan, Thailand, and the Philippines average twice as large as those in Japan or Taiwan (table 4). In most developing countries in Asia, it would be possible to double the number of farmworkers without increasing the number of workers per farm, by reducing the average size of farm by one-half; farms would still average as large as those in Japan or Taiwan. But little is known about how reductions in sizes of farms would affect crop yields in these countries.

There is no simple answer to the question of whether size of farms should be reduced or number of workers per farm should be increased. However, it is significant that Japan and Taiwan have achieved high levels of productivity per hectare with very small farms. Studies conducted in Japan, Iran, and India show that crop yields average higher on small farms than on large farms (10). Farming systems need to be developed that provide satisfactory living conditions for hired farmworkers as well as for operators. In most instances, the plantation system of agriculture has not done this.

The number of workers per farm or holding averages about the same in Japan, Taiwan, and Pakistan as in the Netherlands, Denmark, and the United States (table 4). In these countries most farmwork is done by the farm operator or members of his family.

It is sometimes suggested that farms need to be at least a certain size to provide satisfactory income levels. However, if only 2 hectares of arable land are available per farmworker, farms cannot be established that provide 3 hectares per worker without causing a large amount of unemployment. Because of the prospects for continued population growth in agriculture, average sizes of farms must decrease or more workers must be employed per farm. Furthermore, ways must be found to increase production per hectare and thereby provide satisfactory income levels with less land per person, especially in the densely populated countries.

Conclusions

Agricultural problems in the developing countries today are more difficult than those faced by the developed countries during their early stages of development. Much less agricultural land is available per person in most of the developing countries than was available in European countries, Canada, the United States, Australia, or New Zealand. Consequently, the developing countries now must achieve much higher crop yields per acre than the more mature countries during the corresponding stages of their development.

But even more important is the fact that crop yields must go up much more rapidly in the developing countries in the next 20 to 30 years than they ever did in the now developed countries. Because of rapid population growth and limited land resources, crop yields must increase 3 to 4 percent each year in most developing countries in order to meet expanding food needs. In the developed countries, increases in crop yields of 1 to 2 percent a year were large enough to meet expanding food needs because population growth was slower or additional land was available for cultivation.

The less developed countries have advantages today because of the advance in agricultural technology. However, high-yielding varieties of crops developed in temperate zones, where most of the developed countries are located, are not well adapted to the tropics where most of the less developed countries are located. Crop yields can be increased through the use of fertilizer and pesticides, but capital to finance the use of these materials is scarce in the less developed countries.

Continued population growth in rural areas of the developing countries will cause heavy pressure on land resources. Expansion of employment opportunities in urban areas resulting from industrialization can absorb only a small

share--probably less than half--of the growing agricultural population. Farms average relatively small in most developing countries, usually less than 5 hectares. But they will need to become even smaller and increase in number in most of these countries unless the number of workers employed per farm is increased.

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Social Backgrounds and Occupational Commitment of Male Wageworkers in Agriculture

By Otis Dudley Duncan and James D. Cowhig[1]

MORE THAN IN any other industry, wage and salary work in agriculture is characterized by a high degree of seasonality and comparatively short job tenure. By contrast, there is little seasonal fluctuation in the number of self-employed in agriculture (apart from that associated with the steady decline in farm numbers). Most of the self-employed are farm operators, and their job tenure exceeds that of the nonagricultural self-employed, not to mention that of hired workers in nonagricultural industries (3, 4).[2] The impermanence of attachments to agricultural jobs is illustrated by the fact that 2.4 million men did farmwork for cash wages at some time during 1961, but only 1.5 million of them did 25 or more days of such work during the year (1). Monthly labor force surveys in 1961 showed that as many as 1.8 million men were employed as agricultural wage and salary workers in August and as few as 1.1 million in December, the average number for the 12 months of 1961 being 1.5 million. In February 1962, 2.0 million men reported that their longest job during 1961 was wage and salary work in agriculture (4, 6).

This study concerns the approximately 1.2 million men, 20 to 64 years of age in March 1962, whose longest job in 1961 was agricultural wage and salary work. For brevity, we shall refer to agricultural wage and salary workers as "farm wageworkers." In point of fact, as indicated by decennial census data, the vast majority of wage and salary workers in agriculture are classified occupationally as farm laborers and foremen.

Although restricting the universe to men aged 20 to 64 means that we are dealing with a minority of the persons in such employment, it is an especially significant minority. Men 20 to 64 years old comprised about 41 percent of all farm wageworkers in 1961, but they accounted for about 69 percent of all man-days of farm wagework in that year. The same subgroup accounted for perhaps three-quarters of the household heads hired as farmworkers at some time during the year (2). In eliminating the very young, the very old, and those whose longest jobs were in another category, we are dealing with persons whose connection with this type of employment is more than nominal. At the same time--and this is really the crucial point in the study--the men in this group are strikingly differentiated by their degree of commitment to farm wagework as well as by factors leading to such employment.

The reason for making a detailed analysis of backgrounds leading to farm wagework is hardly obscure in a period when the problem of low income is in the forefront of public discussion. In 1961, the median earnings of male wage and salary workers in agriculture (so classified by longest job) amounted to $785, or 17 percent of the median of $4,605 for all men who worked in that year. Limiting the comparison to men who

[1] The analysis reported in this paper was begun in connection with Mr. Cowhig's former duties with the Economic Research Service, and the authors are indebted to that agency for permission to make use of the statistical tabulations it had procured from the Bureau of the Census. The collection and initial processing of the data by the Bureau of the Census was supported by Grant No. G-16233 from the National Science Foundation to the University of Chicago for a project directed by Peter M. Blau and Otis Dudley Duncan. The paper was completed in connection with Contract No. OE 5-85-072 of the U.S. Office of Education with the University of Michigan for Mr. Duncan's project on "Socioeconomic Background and Occupational Achievement."

[2] Underscored numbers in parentheses refer to items in the Literature Cited, page 135.

worked full time for the entire year, we find a median of $2,357 for agricultural wage and salary workers as against $5,595 for all men (7). Neither comparison pertains precisely to the population studied here, since the income data include men under the age of 20 and those 65 and over, as well as those 20 to 64, while the category of year-round, full-time workers undoubtedly includes only a fraction of those with longest jobs as farm wageworkers. It is evident, nonetheless, that farm wageworkers are at a marked disadvantage economically by comparison with any other major occupation or industry category of workers. Although farm wageworkers are by no means a major segment of the overall poverty problem, it is becoming clear that any sophisticated understanding of that problem requires meticulous study of each of its components. If many farm wageworkers are indeed to be classified as "in poverty," it is well to examine where the men in this line of work came from and the social characteristics that may be related to their propensity to engage in it.

Source of Data

The statistics in this study are derived from the February and March 1962 Current Population Survey (CPS) of the Bureau of the Census and a questionnaire supplement thereto, "Occupational Changes in a Generation" (OCG), administered in March to men 20 to 64 years old (8). About five-sixths of the eligible respondents completed the questionnaire. The classification of men by longest job in 1961 was made on the basis of the February CPS sample, approximately three-fourths of whom were also interviewed in March. The data, therefore, pertain to about three-fourths of the OCG respondents, who were themselves a subgroup of the sample eligible in March.

Sampling errors are somewhat higher in this study than for most officially reported occupation data derived from CPS and published in the monthly and special reports on the labor force issued by the Bureau of Labor Statistics. Sample inflation factors for OCG tabulations make allowance for nonresponse to the OCG questionnaire. In this paper a very rough allowance for the loss due to nonoverlap of the February and March panels has been made by multiplying tabulated population estimates by 4/3, although this procedure is not strictly justified by the sample design. In this way we reached an estimate of 1.24 million men 20 to 64 years old with longest jobs as agricultural wage and salary worker in 1961 (based on the tabulated estimate of 930,000). Since the total civilian noninstitutional population of such men was estimated at about 45 million, we obtained a "recruitment rate" of 1.24/45 = 2.8 percent of men with this work experience. Recruitment rate in this paper means farm wageworkers as a percentage of all men in the OCG sample.

Differential Recruitment and Commitment

Two items of background information are virtually unique to the OCG study: Occupation of the head of the respondent's family (usually his father) at the time the respondent was "about 16 years old," and the respondent's own "first full-time job after you left school," not counting part-time jobs, jobs held during school vacations, or military service.

Table 1 describes recruitment to farm wagework in terms of these two measures of occupational origins. First, in the columns headed "percentage distribution," we have the proportions of all farm wageworkers who have the specified origins. A bare majority of these workers had fathers who were engaged in farm occupations, assuming, for convenience (the number involved is small), that "not reported" implies a nonfarm occupation for the father. Only one in nine farm wageworkers, moreover, had a father who was a farm laborer at the time the respondent was age 16. Hence, a large majority of farm wageworkers, even though we cannot specify the size of that majority with precision, represent recruitment via downward intergenerational occupational mobility: That is, the great majority of men 20 to 64 years old employed as farm wageworkers in 1961 had fathers who were employed in higher status occupations. This conclusion rests on the assumption, borne out by census data on income, that farm operators

Table 1.--Percentage distribution and recruitment rates of men 20 to 64 years old in the civilian noninstitutional population reporting wage or salary work in agriculture as longest job in 1961, by father's occupation and farmworker's first job, March 1962

Occupational classification	Percentage distribution by--		Recruitment rate[1]	
	Father's occupation	First job	Father's occupation	First job
	Percent	*Percent*	*Percent*	*Percent*
All occupations.....	100.0	100.0	2.8	2.8
White collar.....	8.3	13.8	1.0	1.5
Manual and service.....	31.9	37.3	2.1	2.0
Farmers and farm managers....	39.4	5.9	4.5	5.5
Farm laborers and foremen....	11.2	36.4	12.0	7.5
Not reported.....	9.2	6.6	3.1	3.1

[1] Farm wageworkers as a percentage of all men in OCG sample with the designated occupational background.

and persons in most nonfarm occupations (even those in the manual category) enjoy higher socioeconomic status than farm wageworkers. Downward mobility, rather than the "inheritance of poverty" which figures so prominently in current public discussion, is the prevailing route to farm wagework.

If we consider first job as the benchmark for recruitment, we again find a heavy influx into farm wagework from nonfarm career beginnings--51 to 58 percent, depending on how the "not reported" are distributed. Of those who did enter the labor force in the farm sector, however, 36.4 percent began as farm laborers.

Using a particularly stringent definition of self-recruitment (recruitment from a background of farm wagework), but one not inconsistent with the "inheritance of poverty" thesis, we computed that only 8.1 percent, or 1 in 12, of the men employed as farm wageworkers both had fathers who were farm laborers and took their own first jobs as farm laborers (data not shown in tables).

This picture of the makeup of farm wageworkers by occupational origins is complemented by relating the numbers in farm wagework to the total number included in the survey. Of all men covered in the OCG survey, 2.8 percent held their longest job in 1961 as farm wageworkers. We refer to a figure of this type as the "rate" of recruitment. In the last pair of columns in table 1 we see wide variation in the rate by categories of origin. The lowest rates are found for white-collar origins, and just slightly higher ones for nonfarm manual labor origins. Rates higher than the general average are observed for men with farm origins, especially those with fathers or first jobs classified as farm laborers. Yet the highest rate, 12 percent, implies that less than one in eight men whose fathers were farm laborers were recruited to longest jobs as farm wageworkers in 1961. Evidently the tendency to "inherit" this low-status occupation is slight.

Approximately 1.3 percent of all men in the OCG sample had both fathers and first jobs in the farm laborer category (data not shown in tables). Although this combination of origins might appear to be especially conducive to farm wage employment in 1961, the rate for this subcategory was only 16.6. Thus, just one in six men with the occupational background that would seem most likely to lead to this kind of work actually accepted such employment, while the remaining five-sixths underwent some degree of upward mobility.

Both the analysis of the background composition of farm wageworkers and the comparison of rates of recruitment to this occupation indicate that there is much mobility into and

out of this category. This conclusion is contrary to what one might have supposed on the basis of the "inheritance" thesis. At the same time, some backgrounds are much more conducive to farm wage employment than others and to commitment to this type of work.

Our tabulations permit a limited analysis not only of longest job in 1961, but also of the occupational classification as of March 1962, based either on the job held at that time or the last previous job of men then unemployed. Nearly all (97 percent) of the men reporting farm wagework as their longest job in 1961 were still in the experienced civilian labor force in March 1962. Only three in seven (43.3 percent) of those reporting an occupation in March 1962 were farm laborers and foremen; the remainder had moved from farm wagework to some other pursuit at this period near the seasonal low of farm employment.

The propensity to move out of farmwork, however, differed sharply by background. Among the slightly more than one-half of farm wageworkers in 1961 whose fathers were in farm occupations (farmers or farm laborers), 62.3 percent continued as farm laborers in March 1962, while only 23.3 percent of those with nonfarm origins continued in this line of work. Similarly, when the 1961 farm wageworkers are classified by first job, we find that 67.8 percent with first jobs on farms were farm laborers in March 1962, as contrasted with 25.7 percent of those with nonfarm first jobs (including first job not reported). Farm employment, therefore, markedly augments the commitment to farm wagework.

Differential commitment can also be inferred from data on place of residence in March 1962 (table 2). Here and subsequently, we use the term "farm background" to distinguish the man whose father had some kind of farm occupation from the one whose father's occupation was in a nonfarm category or was not reported. An overwhelming majority (81 percent) of farm wageworkers with farm background lived in rural residences in March 1962, while only two-fifths (40.5 percent) of those with nonfarm background lived in rural areas at that time. In terms of both occupation and residence, therefore, men with nonfarm backgrounds doing farmwork in 1961 were much less committed to farm pursuits than those with farm background. It has long been known that much farmwork is done on a casual basis. The present analysis shows that the casual component of the farm work force is much more likely to be recruited from nonfarm origins than the noncasual.

Table 2.--Percentage distribution of men 20 to 64 years old reporting longest job in 1961 as agricultural wage or salary worker, by background and by residence in March 1962

Residence	Total	Background	
		Nonfarm	Farm[1]
	Percent	*Percent*	*Percent*
All places	100.0	100.0	100.0
Urbanized areas	24.0	40.1	8.3
Other urban (under 50,000)	14.8	19.4	10.4
Rural nonfarm	30.8	25.0	36.4
Rural farm	30.4	15.5	44.9

[1] Father's occupation reported as farmer, farm manager, farm laborer, or farm foreman.

Differential Recruitment by Background

Given the fact that farm wageworkers are recruited disproportionately from men with farm origins, it is appropriate to inquire what other characteristics render men especially liable to this kind of work experience. Table 3 describes the population under study in terms of various social characteristics. Again, the data are arranged to permit analysis from two complementary points of view: The composition of the farm wageworker population (first three columns of table 3, headed "Percentage distribution"), and the rate of recruitment to this line of work, relative to the total numbers in the OCG population (last three columns, headed "Recruitment rate"). Both the composition and the recruitment rates are affected by farm background.

Age.--Although the age limits on the OCG universe serve to eliminate the teenagers whose commitment to farm wagework is likely to be especially casual, we infer from the fact that three-eighths of the workers with nonfarm background are under 25 that their connection with agriculture is highly transitory. Some, but not all, of these young men appear to be college students doing farmwork during college vacations. Among men with farm background, the high rate of recruitment to farm wagework at age 20-24, followed by the precipitous drop at ages 25 and over, suggests that even this segment includes many with only temporary involvement in farmwork.

Color.--A heavy majority of farm wageworkers, regardless of background, are white. Yet the number of nonwhites is disproportionately high, as can be seen from the differential rates of recruitment. Nonwhite men with farm origins are especially likely to have been farm wageworkers in 1961, since the specific rate of recruitment for this category reaches the comparatively high figure of 12.6 per 100.

Siblings.--A majority of farm wageworkers come from families with five or more children, but the same is true of all men in this age group. Hence the rate of recruitment from large families, irrespective of farm background, is only slightly above the general average. It is curious (and possibly due only to sampling variation) that men with one to three siblings are less prone to do farm wagework than only sons. The higher rate for only sons among men with farm background may suggest some unusual attachment to farm work on their part.

Family background.--Men from broken families have a slightly greater probability of entering farmwork than those growing up with both parents. Such an effect could well be due, indirectly, to other socioeconomic factors related to family status.

Residence history.--Men living in rural areas at age 16, whether or not their fathers were in farm occupations, are more likely to be in farm wagework than those from urban areas. Since farm background, in the sense of father's occupation, is controlled in this analysis, it appears that residence has an independent effect. Despite the higher rate of recruitment of men from rural areas, fewer than three-fifths of all farm wageworkers lived in rural territory at adolescence. Recruitment to farm wagework occurs at a slightly higher rate for nonmigrants than for migrants. (Migration is defined here in terms of the respondent's report that at age 16 he lived in a different community from the one where he lived in March 1962.)

Father's education.--About half of all farm wageworkers reported that their fathers completed less than 8 years of schooling. Bearing in mind the educational standards prevailing in the previous generation, however, it is not surprising that the recruitment rate for this level of father's education, once father's occupation is held constant, is only moderately higher than the general average.

Respondent's education.--More decided differentials are observed for this immediate measure of educational background. Liability to 1961 experience as a farm wageworker was appreciably enhanced for men with nonfarm background having 8 years of schooling or less and for men with farm background having less than 8 years. Especially low recruitment rates from both origin sectors are noted for men with any college training.

Table 3.--Percentage distribution and recruitment rates for men 20 to 64 years old in the civilian noninstitutional population reporting wage or salary work in agriculture as longest job in 1961, by background and social characteristics, March 1962

Characteristic	Percentage distribution			Recruitment rate[1]		
	All men	Nonfarm background	Farm background[2]	All men	Nonfarm background	Farm background[2]
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Total	100.0	100.0	100.0	2.8	1.9	5.2
Age (years):						
20 to 24	26.1	37.6	14.9	6.5	5.4	12.9
25 to 34	22.0	20.5	23.6	2.6	1.5	6.8
35 to 44	20.7	18.9	22.3	2.2	1.4	4.5
45 to 54	15.1	10.2	19.8	1.8	0.9	3.8
55 to 64	16.1	12.8	19.4	2.6	1.7	4.3
Color:						
White	71.2	78.3	64.2	2.2	1.6	3.9
Nonwhite	28.8	21.7	35.8	7.8	4.8	12.6
Number of siblings:						
None	6.4	8.5	4.4	2.7	2.0	7.9
1 to 3	30.3	37.2	23.6	2.0	1.5	4.5
4 or more[3]	63.3	54.3	72.0	3.4	2.2	5.4
Family background:						
Intact family	79.5	73.2	85.6	2.7	1.7	5.1
Broken family[4]	20.5	26.8	14.4	3.2	2.6	5.8
Residence at age 16:						
Rural	57.9	33.7	81.5	4.7	3.4	5.4
Other or unknown	42.1	66.3	18.5	1.8	1.5	4.3
Migration status:						
Nonmigrant[5]	52.1	48.7	55.4	3.3	2.0	7.5
Migrant	47.9	51.3	44.6	2.3	1.7	3.7
Father's education:						
Not reported	11.4	10.9	11.9	2.8	1.8	5.2
Less than 8	50.2	42.6	57.7	4.0	2.6	6.4
Elementary, 8	16.6	14.8	18.3	1.9	1.2	3.6
High school, 1-3	7.7	10.9	4.5	2.2	1.9	3.5
High school, 4	9.7	14.0	5.5	2.2	1.8	5.3
College, 1 or more	4.4	6.8	2.1	1.4	1.2	3.9
Education:						
Less than 8	30.4	22.7	38.0	5.6	4.0	7.2
Elementary, 8	22.7	20.3	25.1	4.6	3.6	5.9
High school, 1-3	18.0	18.5	17.4	2.6	1.8	5.2
High school, 4	19.2	23.5	15.1	1.9	1.4	3.5
College, 1 or more	9.7	15.0	4.4	1.1	1.0	2.2

[1] Farm wageworkers as a percentage of all men in OCG sample with the designated characteristics. [2] Father's occupation reported as farmer, farm manager, farm laborer, or farm foreman. [3] Includes a small number who did not report number of siblings. [4] Did not live with both parents "most of the time up to age 16"; includes family status not reported. [5] Lived in same community or same rural area at age 16 as in March 1962.

Comment

The patterns of recruitment, in summary, consist of differentials revealing factors which enhance the likelihood that a man will have his primary work experience during a given year in farm wagework. These factors operate in the same general way for men with nonfarm origins as for men with farm backgrounds, although the overall and specific rates are uniformly higher for the latter. Characteristics leading to higher than average rates of recruitment to farm wagework include youth, nonwhite color, rural residence in adolescence, lack of geographic mobility, and low level of educational preparation. There is no doubt that men with a combination of social disadvantages appear in disproportionate numbers in farm wagework--a line of work which is unfavorable in terms of remuneration and opportunity. At the same time, the composition of the farm wageworker category as a whole reminds us that many men find their way into this kind of employment even without such obvious predisposing factors. Not all men in this low-status pursuit are there because of gross social disadvantages, nor is there any overwhelming probability that a man will become a farm wageworker whatever his configuration of social characteristics.

It is generally agreed that the low incomes of farmworkers constitute a social problem and a significant part of the target in the war on poverty. Our evidence is, however, that many individuals are able to move out of this job category. Only a small minority of farm wageworkers apparently were "destined to poverty almost from birth--by their color or by the economic status or occupation of their parents," even if we assume that having this kind of work experience in a given year creates a strong liability to the status of being poor (5). Much of the work done for wages on our Nation's farms is done by men with no lifelong commitment to such employment or, indeed, no such commitment lasting beyond a season. The analysis of differential recruitment and commitment to farm wagework is consistent with current efforts to distinguish the transitory and remediable elements of the poverty problem from those more resistant to change.

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Book Reviews

Development Planning: Lessons of Experience

By Albert Waterston. The Johns Hopkins Press, Baltimore, Md. 1965. 687 pages. $10.75.

PLANNING FOR NATIONAL economic development has become almost universal. The socialized countries from the beginning propagated the official doctrine that a comprehensive plan with detailed centralized direction was essential for rapid growth, although they are having some second thoughts now. The developing countries have universally undertaken some sort of national economic planning. Since World War II, most of the economically advanced countries, with the possible exceptions of the United States and West Germany, have gone in for planning.

Albert Waterston and a group of collaborators at the International Bank for Reconstruction and Development have since 1958 been collecting and analyzing information about economic plans, planning processes, and performance of more than 100 countries. This task has culminated in a readable, interesting, and extremely useful book.

Waterston, who teaches courses for planners at the International Bank's Economic Development Institute, had previously written monographs on planning in Morocco, Pakistan, and Yugoslavia. The present study draws on his wide experience with planning in those and many other countries.

The first part of the book discusses the development planning process as it has evolved in a wide variety of circumstances and institutions in both socialized and mixed economies. There are discussions of "comprehensive" or overall planning, project planning, data needs, the budget's role (including a separate section on program and performance budgeting), and administrative problems.

In a chapter on the implementation of plans, the author frankly states that there have been many more failures than successes. The greatest shortfalls are usually in agriculture. Where industry is made up of a public sector and a private sector, it is usually the latter which comes closest to achieving growth targets. Failures are amply illustrated with examples, some of them being impressively horrible. The author concludes that: "Failures are traceable to unduly ambitious targets and poor financial controls, the widespread failure of governments to maintain the discipline implicit in their plans, token efforts to co-ordinate economic and financial policies as required by plans, the absence of general criteria and procedures for selecting projects and programs in accordance with plan objectives, and, perhaps the most common reason for failure, inadequate project selection and preparation."

The second part of the book is devoted to a discussion of the organization of planning, including such diverse but vital topics as the relations between the planning agency and the budget office, relations between planning and the statistical agency, negotiating foreign financing, types and organization of central planning agencies, etc. Here, as throughout the book, the approach is essentially analytical.

The book contains several appendixes which include listings of national plans and planning agencies.

Mr. Waterston consigns to the Limbo of Academia the "doctrinal debate about whether a country should plan." He points out that those who equate planning with socialism and who evaluate planning as incompatible with freedom and private enterprise are a "dwindling band." He says that Arthur Lewis' statement in 1949 that "we are all planners now" may have been a little premature but it is nearly indisputable today.

The book makes abundantly clear that planning as it is practiced contains only small elements of science but large elements of judgment and muddling through. It gives many examples of the infinite possibilities of slips 'twixt the equations

and the products. Yet Mr. Waterston is in favor of planning, especially better planning. In his preface he expresses the hope that his concentration on the numerous and challenging unresolved problems of planning has not given his study an "unduly pessimistic orientation."

I enthusiastically recommend this book to all planners, and to economists and econometricians interested in planning, economic development, or comparative economic systems. The book is nontechnical, in that there is no elaboration of mathematical or statistical techniques. It does not answer definitively all the hard questions about planning, but it contains much wisdom.

Joseph W. Willett

Research and Education for Regional and Area Development

By Iowa State University Center for Agricultural and Economic Development. Iowa State University Press, Ames, Iowa. 287 pages. 1966. $4.95.

ECONOMISTS INTERESTED IN agriculture have recently been asking questions that go beyond firms and households but reach to less than the total national level of activity. These regional questions have led to a series of discussions and publications about area analysis. "Research and Education for Regional and Area Development" is one of several recent outgrowths of such discussions. It is the record of a conference sponsored by the Center for Agricultural and Economic Development, in Ames, Iowa, in October 1964. Other, related sets of papers are appearing. The Agricultural Policy Institute, North Carolina State University, published the papers on Regional Development Analysis presented in Stillwater, Okla., in May 1963. And they published the papers on Problems of Chronically Depressed Rural Areas presented in Asheville, N.C., in April 1965. The Louisiana State University Press has in process the papers that were presented in Baton Rouge, La., in March 1966 on Regional Analysis of Income Distribution.

The volume at hand is reviewed and the papers are neatly summarized, one by one, in the opening 12 pages, by Wilbur Maki and Brian Berry.

The opening discussion seeks to answer basic questions about area delineation. Several subsequent papers pick up the topic, at least briefly. The upshot is a myriad of viewpoints on the subject. One is given the impression that while there may be a discernible "best" delineation, analysts are likely to lean to different subsets of the economy for different purposes and may often simply accept what is politically expedient or what is best described with available data. The perfect delineation for 1966 conditions may prove less important in our changing environment than some generally acceptable delineation of the United States into possibly 500 areas, leading to an early reporting system on which to base local plans for growth and for expanding economic opportunity.

Regional objectives are discussed in several of the papers. Considerable light is cast on the role of income, employment, growth, and equity in guiding local policy. However, some of the authors are superior to others in their ability to convey the distinction between regional goals and those of (1) firms and households, or (2) the Nation. Even so, the book as a whole makes it clear that regional policies are of a different species than those made at other levels.

A number of basic factors affecting growth are discussed in these pages. The needed emphasis on the role of imports and exports is clear, and the nature of community capital in the form of roads, buildings, governments, educational systems, and so on is brought out. In the discussions about the extent to which available resources limit growth potential, water claimed 20 pages of space; constraints on land, labor, and capital supplies were relatively overlooked.

Beyond economics, there are papers discussing social institutions, political processes, legal structures, and a plea to accept political realities along with physical ones. Just as the optimism of economists leads to more complete theories of growth than of decay, so those papers that go beyond economics appear more at home dealing with problems of organization and progress than with disorganization and stagnation.

The need for a system of social accounts is developed among these pages for describing the status quo, building analytic models, and measuring progress. Some theories of regional growth are propounded and the argument as to

whether "basic" variables are more fundamental than "nonbasic" ones is continued.

An interesting, yet incomplete, overview of a variety of models being used in regional analysis is discussed by several of the authors. An interregional equilibrium model based on minimal costs of production and transportation is presented. Other techniques explained include shift analysis, base studies, input/output, and simulation.

Overall, the book leads the reader down a few blind alleys and contains some filler, but it also contains important insights into the problems and solutions relating to control of the local economic environment of farmers and their nonfarm neighbors.

Clark Edwards

Education and Economic Development

Edited by C. Arnold Anderson and Mary Jean Bowman. Aldine Publishing Company, Chicago. 429 pages. 1965. $10.75.

THIS VOLUME is the outgrowth of a conference on the Role of Education in the Early Stages of Development held in Chicago, April 4-6, 1963. The conference was sponsored jointly by the Committee on Economic Growth of the Social Science Research Council and the Comparative Education Center of the University of Chicago.

It is an interdisciplinary exploration of one of the most stubborn problems confronting the developing nations. The list of participants and contributors includes outstanding authorities in the fields of economics, sociology, education, and history. Several are experts on particular developing countries such as Ghana, India, Brazil, Chile, and Japan. The historians have made a unique contribution in providing the planners and the theorists with historical perspective on the educational systems of some of the countries which are making or have successfully made strenuous efforts to achieve "takeoff."

Particular attention is devoted to the role of education in early-stage agriculture in a chapter by Clifton R. Wharton, Jr., but the relevance of this book to those interested in agricultural development is not limited to this chapter. The historical evidence shows that literacy and schooling were more widespread in preindustrial Western nations than has been commonly appreciated. The editors conclude that "literacy of a large minority of males is a precondition for any significant transformation of an underdeveloped economy into one marked by sustained growth."

Jane M. Porter

The College of Agriculture: Science in the Public Service

By Charles E. Kellogg and David C. Knapp. McGraw-Hill Book Company, New York. 1966. 237 pages. $6.95.

"SOME COLLEGES of agriculture have lost their sense of urgency because they have not looked far enough ahead." So state authors Kellogg and Knapp in beginning their final chapter. But they end their book on a note of challenge and promise. "The colleges of agriculture can (underscoring added) meet the challenge of change. They can strike out boldly. . .be leaders in education, agriculture, the biological sciences, environmental improvement, and resource use and development. . . They can set new standards of excellence as academic institutions devoted to public service."

This book is the newest in the Carnegie Series in American Education. It resulted from a 3-year study of American colleges of agriculture suggested and supported by the Carnegie Corporations. The study began in 1962, the centennial of the Morrill Act, the origin of most colleges of agriculture in the land-grant universities.

The authors present good credentials and varied experience for this study. David C. Knapp, the junior author, is a specialist on agricultural policy and academic administration. He is currently director of the Institute for College and University Administrators, a special training program operated by the American Council on Education.

The senior author is Charles E. Kellogg, Deputy Administrator of USDA's Soil Conservation Service, a soil scientist long interested in promoting excellence in liberal education for agricultural specialists. The imprint of Kellogg's philosophy is clearly evident throughout.

Their concept of a liberally educated man in agriculture is summarized by stating that he "needs to possess knowledge of the symbols of our culture--of language, mathematics, logic, science, and the humanities--and skills in their use." Only through this approach to education can progress be made in lessening the cultural dichotomy between the scientific and literary intellectuals described by C. P. Snow. Further, the authors stress that most specialists in agriculture will need graduate study and even that will not suffice. The specialist will work with ideas and materials unknown to him as a student. Self-directed study in later life is a requisite; the undergraduate emphasis on knowledge of symbols of our culture and on principles should provide the needed foundation for this continuing study. Their chapter 3, "Higher Education in Agriculture," spells out the goals of an undergraduate education and the curriculum recommended to reach these goals. This is must reading for curriculum committee members.

To many of us who are not-too-recent graduates of colleges of agriculture, the concept of the liberally educated man may only remind us of a lost 4 years of our youth. Courses in rural sanitation, mechanical drawing, and livestock judging were in my first college quarter. Fortunately, their inadequacies did awaken me to find the flexibility in substituting courses that the senior author notes he found in the early twenties. But this is no answer to the problem. So it is heartening to read that "the leading agricultural colleges are now placing more emphasis on education for long-term intellectual growth and less on how-to-do-it training in techniques needed for the first job."

Kellogg and Knapp review the performance of the colleges in teaching, research, and extension. The book contains many useful facts documenting trends but its prime emphasis is on interpretation and specific recommendations. Each of the principal chapters concludes with a list of concise and relevant "Suggestions."

The authors are sympathetic but not uncritical in their scholarly study of the agricultural colleges. Some students may think they are too sympathetic in their treatment. It is a book of great immediate interest to deans and directors as well as all faculty of these colleges, but its appeal extends to all who work in agriculture in the broadest sense.

The book is itself an excellent springboard for the self-directed study recommended in it, particularly since it is short, well written, and readable.

Kenneth E. Ogren

Farm to Factory: A History of the Consumers Cooperative Association

By Gilbert C. Fite. University of Missouri Press, Columbia. 1965. 288 pages. $6.

THE TITLE of this book might well have been "From a Two-Car Garage to Number 249." The author has done a commendable job in relating how the Consumers Cooperative Association of Kansas City, Mo., a regional wholesale cooperative, grew from a small petroleum products brokerage firm in 1929 to number 249 in the 1964 list of the Nation's 500 largest industrial cooperatives. The story of the expansion into blending plants, refineries, pipelines, oil wells, fertilizer plants, feed mills, and a number of other enterprises (which did not all turn out so well) is interesting and dramatic. It is also enlightening as an account of all the economic, social, and political factors that were coordinated to achieve success for a farmer cooperative.

Consumers Cooperative Association (CCA) began as the Union Oil Company in 1929 in a two-car garage. Its expansion began in the middle of the depression of the 1930's. Readers who are interested in how its growth was financed, where the money came from, and in what form, will find the book informative, though lacking in specific details. In 1954-55 CCA went through a financial ordeal that many people may not have known about; the Farm Credit Administration apparently thought it was relying too heavily upon debt capital and was overexpanded in some operations. Researchers should be able to develop many principles of cooperative financing out of that experience.

The book begins with a chapter on the farm problems and the cooperative movement from 1865 to 1920. To some readers this chapter

may be informative but for most professional economists it says nothing significantly new. In fact, some statements seem rather naive: "Farmers, however, did not even try to set production goals. They took the position that so long as people were hungry anywhere in the world no genuine surplus existed."

Later chapters are centered on the activities of Howard A. Cowden, who was president and general manager, and, later, chairman of the board of directors. In some chapters the author brings in sidelights on Cowden, such as his interest in international cooperative endeavors, that may have been more appropriate to a biography of Cowden than to a history of CCA.

Cowden appears to have had hopes of building a cooperative society. When this nearly ruined CCA, drastic action by Farm Credit Administration and others was needed to force CCA to drop various unprofitable business activities.

The book does not provide much insight as to Cowden's business acumen, or even as to the economic situation that provided the opportunity for Union Oil Company to enter and expand to become CCA.

If a reader is interested in the role of the cooperative philosophy in making CCA a success, the book will only add to the difficulties of making broad generalizations. Sometimes the author seems convinced that CCA's educational effort on cooperation has been successful; then he quotes, seemingly with approval, statements that farmers are only interested in the savings. However, some limited generalizations do seem safe: (1) Cowden and others associated with him were highly inspired and motivated by cooperative ideals; (2) patrons' loyalty to the cooperative was a significant factor in survival and growth, especially in several crucial situations; (3) Government policies and programs had much to do with survival and growth of the cooperative; (4) a public image of cooperatives as a necessary economic tool of farmers in achieving reasonable prices on what they buy and sell is to be preferred to visions of a cooperative commonwealth or a gigantic business success; and (5) cooperatives must be a social and political force to survive and grow.

The author indicates that by now CCA is ready to be considered a farmer supply cooperative, and that the word "consumers" should not be in its name. CCA's recent expansion into farm product marketing and processing, also, seems to signify a new approach.

In conclusion, the book appears to be a frank history of CCA. It is written in a readable manner that makes it interesting and valuable to farmers and to professional economists, although the latter will at many points wish for more details.

As one reader I wish to pay my respects to Howard A. Cowden and the men associated with him for a tremendous accomplishment for American agriculture. Without their intelligence, insight, and dedication, CCA would never have been the great agricultural success it is today.

Lloyd C. Halvorson

The Farmer

By Wheeler McMillen. Potomac Books, Washington, D.C. 120 pages. 1966. $3.

THE AMERICAN FARMER leads the world in his productive efficiency. In this clear, concise survey, the author, well known as an agricultural writer, analyzes the factors which have made this efficiency possible, and discusses the types of agriculture found in major areas of the Nation. This volume provides for Americans an understanding of the farmers' contributions to our growth, and for foreign readers an informative, realistic appraisal of American agriculture.

Selected Recent Research Publications in Agricultural Economics Issued by the U.S. Department of Agriculture and Cooperatively by the State Universities and Colleges [1]

Anderson, Dale O., Neil R. Cook, and Daniel D. Badger. ESTIMATION OF IRRIGATION WATER VALUES IN WESTERN OKLAHOMA. Okla. State Univ. Expt. Sta., Proc. Ser. P-528, 33 pp., February 1966. (U.S. Dept. Agr. cooperating.)

Objectives of the study were to determine the value of water used to irrigate crops and pastures and to estimate the optimum allocation of alternative levels of available water among crops in Western Oklahoma. A linear programming analysis was made of typical farms to study the effects of different variables on the value of water. The programming activities included dryland and irrigated crop activities as well as alternative beef and dairy enterprises.

Bernston, Byron L. THE EUROPEAN AGRICULTURAL GUIDANCE AND GUARANTEE FUND. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 144, 32 pp., June 1966.

The European Agricultural Guidance and Guarantee Fund, established by the Council of Ministers of the European Economic Community, began financial operations in the 1962/63 marketing year. The Fund was intended to be the financial arm of the Common Agricultural Policy (CAP). Since its inception, the Fund has rapidly increased its expenditures in support of the CAP.

Brown, Sidney E. THE DEMAND FOR FLOWERS-BY-WIRE. U.S. Dept. Agr., Mktg. Res. Rpt. 762, 36 pp., June 1966.

The number of flower orders placed through the Florists' Transworld Delivery Association (FTD) during 1935-65 (excluding 1941-46) can be related to changes in economic and demographic conditions. Evidence of this effect was obtained from analyses of sales for the United States, nine large metropolitan markets, and seven smaller ones.

Cohn, Edward A., and Lindon N. Crutchfield. OWNERSHIP CHANGES MADE BY BAKERY AND DAIRY PRODUCTS COMPANIES, 1959-64. U.S. Dept. Agr., Econ. Res. Serv., ERS-291, 12 pp., June 1966.

During 1959-64, bakery processing companies averaged 22.0 acquisitions per year, an increase of 48 percent from the 1952-58 period. The annual average of 49.7 acquisitions made by dairy processing companies represented a slight decline (7 percent) from the earlier period. Acquisitions of nondairy firms, however, more than doubled. In the future, Government regulations and court decisions will probably bring increased pressure for acquisitions into diversified fields.

[1] State publications may be obtained from the issuing agencies of the respective States.

Davis, Jeanne M. USES OF AIRPHOTOS FOR RURAL AND URBAN PLANNING. U.S. Dept. Agr., Agr. Handbk. 315, 40 pp., June 1966.

Airphotos have almost unlimited uses for both rural and urban planning. Two major uses are photogrammetry (for making reliable distance, size, and height measurements) and photo interpretation (for identifying objects and judging their significance). Airphotos can be used in preparing base maps, selecting a school site, measuring the acreage of a lake surface, and many other planning purposes.

Garlock, Fred L. FARMERS AND THEIR DEBTS--THE ROLE OF CREDIT IN THE FARM ECONOMY. U.S. Dept. Agr., Agr. Econ. Rpt. 93, 24 pp., June 1966.

The 1960 Sample Survey of Agriculture showed that indebted farmers generally have used credit to enlarge their operations and incomes. Farmers with large operations, landownership, and incomes had much greater debt at the end of 1960 than those with small operations. Only about 10 to 15 percent of the farmers appeared heavily indebted in relation to their landownership or incomes in 1960; an additional 20 to 25 percent had moderately large debts.

Haidacher, Richard C. ESTIMATION OF TRANSPORTATION CHARGE RELATIONSHIPS FOR FROZEN VEGETABLES. Calif. Agr. Expt. Sta., Giannini Found. Res. Rpt. 287, 86 pp., May 1966. (Econ. Res. Serv. cooperating.)

The primary objective of this study was to obtain transfer charges to be used in an interregional competition study for frozen vegetables. A large number of different equation forms were fitted to the sample of truck and rail freight rates separately. Then the combined transfer charge function was derived and results compared to those of other studies.

Hall, Howard L. PERU--MARKET AND COMPETITOR FOR U.S. FARM PRODUCTS. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 157, 44 pp., June 1966.

Peru's agricultural and fishery exports increased from $158 million in 1956 to $385 million in 1964; farm imports expanded from $54 million to $98 million during that period. Peru is expected to continue both as a strong competitor and as a growing market for U.S. agricultural products. Imports of U.S. agricultural products increased from $17.1 million in 1956 to $24.9 million in 1962.

Hatch, Roy E., and D. S. Moore. EFFECTS OF CHANGES IN THE PRICE OF COTTON AND IN LEVELS OF COTTON ALLOTMENTS ON AGGREGATE FARM PRODUCTION IN THE LOWER RIO GRANDE VALLEY OF TEXAS. Tex. Agr. Expt. Sta., MP-802, 40 pp., March 1966. (U.S. Dept. Agr. cooperating.)

Five representative resource situations are delineated, and costs and returns estimates are developed for production alternatives on each resource situation. The costs and returns estimates are used to develop a linear programming model for each resource situation, incorporating production possibilities and institutional, agronomic, and market restrictions.

Hendrickson, Clarence I. THE CHANGED MARKET FOR U.S. CIGAR LEAF TOBACCO. U.S. Dept. Agr., Econ. Res. Serv., ERS-292, 28 pp., July 1966.

Total tobacco consumption in the form of cigars and scrap chewing tobacco has declined greatly in the past 40 years. The absolute quantity used in these forms in the past decade was less than half that used in the 1920's. Since then, cigarettes have become the dominant form of tobacco consumption. Concern over the relation between cigarette smoking and health, however, will probably increase the demand for cigar types of tobacco.

Huff, Judith M., and Hugh A. Johnson. RECREATION FACILITIES AND SERVICES OPERATED BY FHA BORROWERS. U.S. Dept. Agr., Econ. Res. Serv., ERS-294, 16 pp., June 1966.

Under provisions of the Food and Agriculture Act of 1962, farmers can borrow from the FHA to establish income-producing recreation enterprises on their farmlands. Group 1 borrowers--those who had loans specifically to develop recreation facilities--offered a larger variety of facilities and earned larger gross incomes than Group 2 borrowers--those who had developed recreation enterprises independent of FHA financial assistance.

Hunter, Elmer C., and J. Patrick Madden. ECONOMIES OF SIZE FOR SPECIALIZED BEEF FEEDLOTS IN COLORADO. U.S. Dept. Agr., Agr. Econ. Rpt. 91, 52 pp., May 1966.

This report analyzes the economies of size for specialized beef-feeding operations in the South Platte Valley of Colorado. The analysis concludes that it is more profitable for beef-feeding enterprises to own an appropriate size of feed mill than to buy commercially mixed concentrate, and that average feeding cost per head declines sharply as the feedlot size expands up to 1,500 head.

Ibach, D. B. FERTILIZER USE IN THE UNITED STATES: ITS ECONOMIC POSITION AND OUTLOOK. U.S. Dept. Agr., Agr. Econ. Rpt. 92, 28 pp., May 1966.

General advances in farm technology will continue to increase crop yield responses to fertilizer. In 1960-64, farmers received a return of about $2.50 per dollar spent for fertilizer. Projected 1980 crop production needs would require about 450 million acres to be used for crops at the 1960-64 level of technology. This report suggests alternative combinations of fertilizer and land for projected 1980 crop production needs, over a range of possible levels of crop production per acre.

Jones, Harold B., and H. Ronald Smalley. VERTICALLY INTEGRATED METHODS OF PRODUCING AND MARKETING EGGS: AN ECONOMIC EVALUATION. Ga. Agr. Expt. Sta., Univ. Ga. Col. Agr., Athens, Ga., Bul. N.S. 160, 56 pp., May 1966. (Econ. Res. Serv. cooperating.)

The objectives of this study were to: (1) classify and describe the predominant types of egg production and marketing systems in Georgia, (2) determine the degree of vertical integration that exists in these systems, and (3) appraise the competitive position of these firms and the extent to which they are better able to coordinate production and marketing activities.

Larson, Donald K., and Layton S. Thompson. VARIABILITY OF WHEAT YIELDS IN THE GREAT PLAINS. U.S. Dept. Agr., Econ. Res. Serv., ERS-287, 40 pp., June 1966.

This report shows how wheat production varies in nine Great Plains States and how the variability has changed between 1926-48 and 1940-62. The data will be useful for estimating future yields, for appraising land values, and for economic studies in which yield uncertainty is an important consideration.

Mateyka, David T., and Frank D. Reed. COSTS AND RETURNS, COMMERCIAL BROILER FARMS: MAINE, DELMARVA, AND GEORGIA 1965. U.S. Dept. Agr., FCR-38, 20 pp., May 1966.

In 1965, net farm income for typical broiler farms ranged from no change in Maine to 126 percent above the previous year in Georgia. Cash receipts from broilers were up substantially for all farms. Farms which also sell crops showed the most improvement in both cash and net farm income.

McArthur, J'Wayne, and Gary C. Taylor. FEASIBILITY OF ESTABLISHING ALFALFA DEHYDRATING PLANTS IN NORTHWEST RESOURCE CONSERVATION AND DEVELOPMENT PROJECT AREAS. U.S. Dept. Agr., Econ. Res. Serv., ERS-296, 20 pp., July 1966.

The most suitable size for a dehydrating plant in the Upper Willamette RC&D project area appears to be a 1-drum unit, with a production capacity of 1.25 tons per hour and 3,000 tons per year. Under current conditions, establishment of alfalfa dehydrating plants in the Idaho-Washington RC&D project area would not be feasible because of the area's low yields, limited market potentials, and other factors.

O'Dell, Charles A. AN ANALYSIS OF WOOL MARKET NEWS AND ITS IMPORTANCE TO MARKETING EFFICIENCY. U.S. Dept. Agr., Agr. Econ. Rpt. 89, 20 pp., April 1966.

The Consumer and Marketing Service has proposed a joint research project with the Economic Research Service to keep abreast of the increasing complexities of wool market reporting. Actual wool sales for 1960-64 from 9 local market areas were analyzed for price and quality relations with the USDA weekly Boston quotations. Results indicated that, on the average, only 46 percent of variations in USDA Boston quotations were accounted for by similar variations in local market prices.

Pearson, James L. THE ECONOMIC FEASIBILITY OF PROCESSING SELECTED VEGETABLES IN NORTHEASTERN NORTH CAROLINA. U.S. Dept. Agr., Econ. Res. Serv., ERS-279, 32 pp., May 1966. (Florida Agricultural Experiment Stations cooperating.)

Changes in the fresh vegetable marketing structure in northeastern North Carolina have left the growers in a relatively unfavorable position. This report determines if fruit and vegetable processing is economically feasible in the area, establishes the feasible number, size, type, and location of the processing plants, and presents costs and returns that could be expected from a freezing and a canning plant.

Spiegelman, Robert G. ANALYSIS OF URBAN AGGLOMERATION AND ITS MEANING FOR RURAL PEOPLE. U.S. Dept. Agr., Agr. Econ. Rpt. 96, 24 pp., June 1966.

Surveys and analyzes the literature on agglomeration (the clustering of people, business, or structures within an area) for the purpose of defining the nature of agglomeration. The report also suggests further research which will help to improve the economic wellbeing of rural people by developing appropriate actions based on new knowledge.

Stocker, Frederick D. THE ROLE OF LOCAL GOVERNMENT IN ECONOMIC DEVELOPMENT OF RURAL AREAS--RESEARCH NEEDS AND OPPORTUNITIES. U.S. Dept. Agr., Agr. Econ. Rpt. 94, 24 pp., July 1966.

Local government has a strategic role in Federal programs designed to combat poverty in America. Local government is responsible for providing public goods and services, and for maintaining the legal order and stability essential to economic progress. This report provides research approaches in various problem areas of rural poverty and economic development in light of the increasingly important role of local government.

Strickler, Paul E., Helen V. Smith, and Wilbert H. Malther. USES OF AGRICULTURAL MACHINERY IN 1964--CUSTOM AND EXCHANGE WORK--MACHINE RENTAL. U.S. Dept. Agr., Statis. Bul. 377, 20 pp., July 1966.

Of the 153 million acres of all crops harvested by the combine in 1964, 28 percent (43 million acres) was harvested with custom or exchange machines. Machine rental or leasing, on the other hand, is still relatively unimportant, but farmers, machinery dealers, and others in the industry are becoming increasingly interested in these methods. The four machines most often rented or leased were tractors, trucks, fertilizer distributors, and sprayers.

Tegeler, Henrietta Holm. CYPRUS' AGRICULTURAL ECONOMY IN BRIEF. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 159, 12 pp., July 1966.

A continuing problem of this newly independent nation is how to support its predominantly rural population with its limited land area and inadequate natural resources. Since 1960, economic growth in Cyprus has been inhibited by severe unemployment, outflow of capital, withdrawal of British skills, a period of extended drought, and other factors. However, prospects for considerable aid from abroad are favorable.

U.S. Department of Agriculture. AGRICULTURAL MARKETS IN CHANGE. Econ. Res. Serv., Mktg. Econ. Div., Agr. Econ. Rpt. 95, 396 pp., July 1966.

Agricultural marketing has changed in response to many stimuli, some originating within the system and some coming from outside. This report discusses past and prospective changes in markets and marketing functions for agricultural products. It gives a broad view of trends, prospects, and impacts of agricultural marketing in the mid-1960's.

U.S. Department of Agriculture. FARM POPULATION - ESTIMATES FOR 1965. Econ. Res. Serv., ERS-286, 4 pp., April 1966.

U.S. population living on farms in April 1965 totaled 12,363,000. Statistically, this figure differs little from the 1964 estimate. Among the regions, the South, with 45 percent of the total, had the largest farm population. The North Central Region contained 38 percent, and the Northeast and West, less than 10 percent each.

U.S. Department of Agriculture. THE GRAIN-LIVESTOCK ECONOMY OF THE EUROPEAN ECONOMIC COMMUNITY: A HISTORICAL REVIEW, 1951-63. Foreign Agr. Econ. Rpt. 31, 64 pp., July 1966.

The European Economic Community represents the most important commercial overseas market for American farm products. In 1963, the United States sold nearly $1.2 billion worth of agricultural products to the Community. The largest component of this total was grain and grain products, valued at about $360 million.

U.S. Department of Agriculture. SUMMARY AND EVALUATION OF "JAMAICA, TRINIDAD AND TOBAGO, LEEWARD ISLANDS, WINDWARD ISLANDS, BARBADOS, AND BRITISH GUIANA: PROJECTED LEVELS OF DEMAND, SUPPLY, AND IMPORTS OF AGRICULTURAL PRODUCTS TO 1975." Econ. Res. Serv., ERS-Foreign 148, 56 pp., June 1966.

The former West Indies Federation and British Guiana are projected to remain a small but important and rapidly growing source of agricultural trade with the United States in 1975. Agricultural exports from the area to the United States are expected to reach $18.2 million by 1975, and agricultural imports may nearly double to $50.2 million.

Williams, Willard F., and Raymond A. Dietrich. AN INTERREGIONAL ANALYSIS OF THE FED BEEF ECONOMY. U.S. Dept. Agr., Agr. Econ. Rpt. 88, 64 pp., April 1966.

Since World War II, the Nation's fed beef industry has directed increased attention to problems associated with interregional adjustment. In this study, the fed beef economy was conceived as a closely interrelated system of markets and supply areas. The study confirms the widely accepted thesis that location and transportation costs are important determinants of competitive market power in interregional fed beef commerce.

Wilmot, Charles A., and Harold Watson. POWER REQUIREMENTS AND COSTS FOR HIGH-CAPACITY COTTON GINS. U.S. Dept. Agr., Mktg. Res. Rpt. 763, 24 pp., July 1966.

During the early sixties, total connected loads in high-capacity gins were about 74 percent higher in West Texas and 61 percent higher in California than in conventional gins in these areas. Operating loads in high-capacity gins were also higher than in conventional gins, but these differences were less than for connected loads.

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